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CLEMSON UNIVERSITY

# Annual Report

1974-1975

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## PREFACE

Because of one man's dream of a better life for South Carolinians, Clemson University was established to respond to people's needs. Throughout its 82 years of service to the State and Nation, Clemson has remained a "people oriented" institution. Its teaching, research and public service activities touch people's lives every day.

As a state land-grant institution, Clemson's earliest commitments were to the "study of agriculture and natural science." And later to the expansion of industrial growth. These early commitments continue, but they expand as people's needs change. Today, Clemson is responding to a wide range of problems affecting South Carolinians and people everywhere, such as developing new high protein meat substitutes; seeking a safer and higher quality environment; improving health care delivery; creating innovative education programs; broadening recreational opportunities; and seeking to improve man's other basic needs, clothing and housing.

Through these and other commitments, the University's nine colleges and Graduate School are exploring all fields of knowledge to improve life for mankind.

Clemson began its commitment to people when its doors opened in 1893. That day was the realization of a dream come true for Thomas Green Clemson, a man of wisdom and courage who saw the great need in South Carolina for a scientifically oriented institution of higher learning to provide the State's young people with the training which was needed to build a better society.

So strongly was he committed to the need for such an institution that he bequeathed his land and other real and personal property to the State for use in establishing the "high seminary of learning" he envisioned.

Mr. Clemson was a scientist and agriculturalist who came to South Carolina from Pennsylvania in the 1830's and married a daughter of John C. Calhoun, a foremost statesman in South Carolina history and vice president of the United States from 1825-32.

In 1889, the year following Mr. Clemson's death, the South Carolina General Assembly accepted the terms of Mr. Clemson's will, and, following the decision of the U. S. Supreme Court to uphold the will, the State of South Carolina and the full Board of Trustees proceeded to convert the dream of Thomas Green Clemson into the reality of Clemson Agricultural College.

The College also was established under the Morrill Land-Grant Act passed by the National Congress in 1862. Clemson therefore

is a member of the national system of State Universities and Land-Grant Colleges.

In 1964, in recognition of expanded offerings of the institution not only in the areas of agricultural and mechanical arts but also in the sciences and arts, the name of the institution was changed to Clemson University.

The University now has nine colleges and the Graduate School. The colleges are Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Nursing, and Sciences.

This report presents a comprehensive look at Clemson University, its programs and activities during the 1974-75 academic year.

## ACADEMICS

### Graduate Studies and University Research

*Arnold E. Schwartz, Dean*

### Undergraduate Studies

*Claud B. Green, Dean*

### University Extension

*Samuel M. Willis, Dean*

### College of Agricultural Sciences

*Luther P. Anderson, Dean*

### College of Architecture

*Harlan E. McClure, Dean*

### College of Education

*Harold F. Landrith, Dean*

### College of Engineering

*Lyle C. Wilcox, Dean*

### College of Forest and Recreation Resources

*W. H. Davis McGregor, Dean*

### College of Industrial Management and Textile Science

*Wallace D. Trevillian, Dean*

### College of Liberal Arts

*H. Morris Cox, Dean*

### College of Nursing

*Geraldine Labecki, Dean*

### College of Sciences

(formerly Physical, Mathematical and Biological Sciences)

*Henry E. Vogel, Dean*



## COLLEGE OF AGRICULTURAL SCIENCES

### Office of Resident Instruction

Instruction in agriculture basic to South Carolina's needs is completely in harmony with the purpose of Clemson University as outlined in the will of Thomas G. Clemson and in the Morrill Act of 1862, which established the land-grant colleges.

The population of this nation and the world continues to increase, requiring greater quantities of food and fiber. To meet this demand, a larger number of college agricultural graduates will be needed.

The total agricultural industry is dynamic and complex. The College of Agricultural Sciences is continuously revising and modernizing its educational program to ensure that graduates will be properly prepared for future demands. For instance, students in many curricula now can specialize by choosing a minor in Science, Business, Production, International Agriculture, or Environmental Science. In addition, a student may select a minor in a second department, or a department other than the one in which he is majoring. This minor may be in the College of Agricultural Sciences or in one of the other colleges of the University.

The College of Agricultural Sciences recognizes and accepts the responsibility of disseminating factual information about career opportunities in agriculture. To assist in discharging this responsibility, a Public Relations Committee for Resident Instruction in Agriculture was recently organized. The members of this committee, together with other faculty members and some students, visited approximately 60 high schools during the year. They met with guidance counselors, science teachers, agriculture teachers, students, and others as appropriate. Included in the visits was the showing of a new 10-minute slide-tape presentation on career opportunities. Experience indicates that this service is needed and appreciated.

The relative importance of agriculture in the State, Nation, and world is becoming better understood and appreciated by the young people entering Clemson. The first semester, 1974-75, undergraduate enrollment in the College of Agricultural Sciences was 20 per cent higher than that of 1973-74 and 34 per cent higher than that of 1972-73.

### *Agricultural Technology Programs*

Since 1966-67, the College of Agricultural Sciences has cooperated with the State Board for Technical and Comprehensive Education and the State Department of Education in conducting pro-

grams in agricultural technology at selected technical education colleges in the State. The role of this College in this special instructional program primarily involves curriculum planning and development and program evaluation. In addition, the College assists in program operation by making available the research programs and facilities at Clemson and the branch experiment stations for class field trips, laboratory sessions and demonstration purposes, and by providing instructional staff at cost as necessary and feasible for successful program operation.

Currently eight two-year programs and two one-year programs in Agricultural Technology are offered at eight technical education colleges in the State.

Enrollment in the Agricultural Technology programs has been increasing—from 88 in 1969-70 to 371 in 1974-75. Job opportunities and salary levels for graduates of the technology curricula have been very good.

### *Continuing Education*

Modern agriculture is a rapidly changing industry. The fast pace of both adoption of new technology and application of new research results in modern agriculture and rural living necessitates a program of continuing education for professional educators and other agricultural workers to ensure that ongoing programs in which they are involved will be modern, timely, and will utilize the latest research and other information available. Personnel associated with agriculture and rural living in this State who especially benefit from continuing education programs include the county staff of the Cooperative Extension Service, Vocational Agriculture teachers, Soil Conservation Service personnel, State Land Resources Conservation Commission personnel, members of agricultural organizations and agencies, farmers and other special groups.

In-service training programs in agriculture were expanded significantly in 1968-69 as a result of a special state appropriation for this purpose. Continuing education activities in this College currently encompass special in-service training programs for Cooperative Extension Service personnel and Vocational Agriculture teachers in subject matter areas considered to be of greatest current importance. During 1974-75, programs were conducted in such areas as 4-H work, general agriculture, nutrition, and community and rural development.

In addition, this College conducted many other types of continuing education activities, such as seminars, conferences and work-



shops for a wide variety of professional personnel. These programs covered such subject matter areas as a pesticide chemicals school, a nurseryman's short course, a poultry short course, a hortitherapy summer workshop and similar types of specialized continuing education activities.

## COLLEGE OF ARCHITECTURE

The College of Architecture has established an international reputation for quality professional education, expanding its graduate programs and public service and research activities. As a result, it is increasingly sought as a place to study. This has produced serious problems of overcrowding despite careful selectivity of students.

The College occupied a major addition to Lee Hall in early February of the year. These facilities have more than doubled the physical premises of the College. This addition of 60,000 square feet brings the total space in Lee Hall to 105,000 square feet. The new addition includes faculty and administrative offices, a greatly enlarged and relocated College of Architecture library, a jury demonstration-auditorium space, and graduate, research and public service studios and adjunct facilities for each department. These include Architectural Design, Building Science, Planning Studies, and History and Visual Studies. The more than 600 students and a score of sponsored projects now share more optimal accommodations.

### *Overseas Study*

With the ending of the 1974-75 academic year, 50 graduate students in Architecture, Building Science, Planning, and Visual Studies have had the opportunity of being in academic residence and involved in intensive study at the College's new Overseas Center for Building Research and Urban Studies in Genoa, Italy. On March 11, 1975, the overseas program was officially approved by the Italian Government, giving Clemson students all of the rights and privileges of Italian university students by virtue of a decree signed by the President of the Republic.

During the year students in residence at Genoa completed several major research studies, one of which included measured drawings and design proposals for The Restoration and Adaptation of a Baroque Oratorio in Voltaggio. This proposed design converted the old building to a public concert hall. These Clemson graduate studies were published as part of a book on Voltaggio and its valley. Another major overseas design project involved a study of the

Old Port of Genoa, including adaptation and restoration of the ancient and historic buildings to contemporary purposes. This was accompanied by an urban renewal study which converted adjacent depressed areas into public facilities and open recreation space. In the second semester, further planning and design studies were developed as sequential projects based on studies by the earlier groups. A public exhibition and review of the students' projects was attended by local Italian officials and professors from regional institutions. Local leaders were highly impressed with the research effort by Clemson students and expressed warm support for the continuation of these studies.

### *Research and Public Service*

At Clemson, the College plans to develop careful measurement procedures for admission to, and continuation in, student programs at all levels. This is an effort to counsel those less suited to the College's professional demands into other disciplines and to keep enrollment in line with available resources.

Research and public service continued as the major vehicles for teaching, and the State continued as the laboratory for research and public service in environmental design as it has been for two decades. During the year major service efforts included a project sponsored by the Central Correctional Institution in Columbia. The study area was bounded by the Congaree River on the west, Elmwood Avenue on the north, Assembly Street on the east and Gervais Street on the south. Although primarily concerned with those properties on the Old Canal Bank owned by the Central Correctional Institution, which is to be phased out, planning studies included the entire environment within these boundaries. It embraced major problems of automotive and train circulation, housing and commercial and recreational facilities. Students presented project results to civic groups and received considerable attention from the media in Columbia.

As a first phase of planning studies sponsored by a three-year grant from the Mary Reynolds Babcock Foundation, the College, through its Department of Planning Studies, developed guidelines for approaching public service planning studies for those communities in the State too poor and too small to afford normal professional consultant services. In the next two years, these guidelines will be used to implement a promising sequence of planning services to many communities.



Other planning assistance projects done during the year included a major study of Downtown Seneca, a Water Management Quality Planning Study for the State Department of Public Health, a Pickens County Law Enforcement Planning Study and a Pickens County Recreation and Open Space Planning Study. Each project was used as a vehicle for teaching planning procedures, management, design and public relations methods to graduate students.

The Health Care Facilities Planning Studio continued its important collaborative research and design studies for the State Department of Mental Health. These efforts are becoming increasingly complex. The Village Concept of Mental Health Care Delivery was initially the result of these joint studies. These villages are being built and students and faculty have the opportunity to collaborate in every phase of this development in a unique interagency cooperation.

During the year, Village "A" was in the construction phase and progress was monitored by the Studio.

Village "B," which was to be located in the Piedmont, required studio analysis and determination of the best location for the center. Anderson was selected, and further study was made of the relative advantages of particular sites within the community. After the selection, the Studio became collaboratively involved in programming activities.

Preliminary portions of the program also were begun for Village "C," to be located between Darlington and Florence counties. General conferences were held as the State Addiction Center evolved, and master planning studies were made for the South Carolina State Hospital in Columbia to summarize these planning efforts.

During the year the College had 15 visiting lecturers and critics sponsored by the Clemson Architectural Foundation. These bi-weekly programs are open to the public, and enrich the student's education. The College continued its Exhibition Schedule also sponsored by the Foundation. Eighteen shows were presented in Lee Hall Gallery.

The College published the "Semester Review" twice this year. It is a publication of the College's educational and research efforts under the leadership of a student-faculty committee. Expenses are paid by the Foundation, and the journal is sent to faculty, students, architects and planners of the State, and to other accredited architectural schools throughout the nation and abroad.

## COLLEGE OF EDUCATION

Throughout the 1974-75 academic year, the College of Education defined and reevaluated program objectives, reassessed cooperative and in-service education programs, conducted research and provided special services in a number of areas.

The College was inspected by a State Department of Education accreditation committee which used the National Association of State Directors of Teacher Education and Certification (NASDTEC) standards of accreditation. Though the overall rating was satisfactory, the committee report indicated a need for additional faculty and support personnel and more adequate facilities. An evaluation visit was scheduled by a team from the National Council for Accreditation of Teacher Education, but it was postponed until the NASDTEC deficiencies are removed.

### *Cooperative Agreements*

Highlighting the College's developments were accomplishments in the cooperative arrangements with other institutions of higher education in the State. Through contractual arrangements with five cooperating private colleges—Columbia, Erskine, Newberry, Presbyterian and Wofford, the College of Education improved and expanded educational services in the State. The five institutions taught 21 courses which carried Clemson University graduate credit.

A tripartite agreement for doctoral study in Education was signed by Clemson University, the University of South Carolina and the State Department of Education. Under this arrangement the Professional Educational needs of students at the doctoral level will be served more effectively and more efficiently by coordinating programs and services and by cooperating in making them available to students at the two universities. By concentrating upon defined areas and avoiding expensive and unnecessary duplications, Clemson and the University of South Carolina provide a level of training in Education unequalled in many states. The College of Education is developing a Doctor of Education program in Vocational and Technical Education which will be available to students at Clemson and the University of South Carolina.

### *In-Service and Staff Development Programs*

The College conducted 128 off-campus graduate courses in 42 locations, with more than 3,000 students enrolled in credit-granting courses. Another important effort in expanded educational services were two summer sessions of special institute course work for pre-



vocational instructors conducted by the Department of Industrial Education. Funded by an Educational Professional Act Grant, the course work was the first involvement with prevocational instructors in the State.

The cooperation of the Farmers Cooperative Exchange, a South Carolina/North Carolina farmer cooperative, provided for a new experience-based program in Agricultural Education. The course, Agricultural Education 737—"Internship in Agribusiness"—was offered to teachers of agriculture during the summer of 1974. It provided teachers of agriculture with first-hand learning experiences in agricultural sales and service occupations. By observing, analyzing and practicing selected competencies of various occupations and operations in sales and service centers, teachers returned to their classrooms with improved attitudes and teaching skills.

The Department of Industrial Education sponsored seven Trade and Industries workshops for vocational trade instructors during the 1975 summer session. The Department also sponsored, with the State Department of Education, an Appalachian Career Cluster Workshop.

The Vocational Education Media Center conducted workshops and training sessions in materials development, curriculum development, prevocational in-service training, and materials dissemination. The 63 training sessions were attended by more than 1,100 participants.

The College taught courses and conducted workshops in 37 countries.

### *Research and Instructional Media Development*

The cooperative research funded by the Department of Health, Education and Welfare, South Carolina State Department of Education and the Printing Industries of the Carolinas (PICA) the past three years has culminated in project curriculum materials being used in schools across the nation and in three foreign countries. PICA and the State Department of Education are continuing their support of curriculum development in Graphic Arts with a grant to develop additional materials.

The Vocational Education Media Center completed 53 instructional projects for vocational educators in the State. This consisted of 235,000 volumes of material with 8,974 photographs and 516 illustrations. A total of 5,850 audio visual sets were produced. These sets include either slides or filmstrips and tape cassettes. More than 106,000 transparencies were published.



The Center also has assisted the Office of Vocational Education with the Cluster Project by handling all printing, duplication and assembly of this project. It also assisted with word copy for slides, slide development and professional assistance at various times.

Activities of the Center changed considerably during the year with the entry of the State into the Vocational Technical Education Consortium of States. South Carolina is engaged in developing the catalogs of materials for Small Gasoline Engine Repairs and Textile Production. The coordinator and the two project assistants are members of the Center staff. About 50 per cent of the professional staff's efforts are now concentrated in this area of responsibility.

### *Special Activities*

The Department of Military Science and Aerospace Studies sponsored the Third Annual Tiger Drill Meet which provided competition between the drill units of Junior ROTC units from high schools throughout the State. In addition to being the largest meet to date, it was the first time that a special category of all female competition was offered. Governor James B. Edwards issued a proclamation designating the winner of each annual Tiger Drill Meet as the "South Carolina High School JROTC Drill Champion." A member of the Governor's staff made the special presentation at the drill meet. The Department of Military Science conducted the Third Annual Tiger Rifle Meet with representatives from South Carolina high school JROTC units. The Air Force commissioned Clemson's first two female ROTC graduates.

The Annual Reading Conference was attended by approximately 1,100 educators from 15 states.

The Educational Clinic provided service to 60 public school pupils.

A study of the progress results made by students enrolled in the three "Developmental Reading" courses indicated significant gains in reading comprehension and rate for all sections and in two sections of vocabulary. In a matched comparison, the grade-point-ratio and English grades were highly significant in favor of the students enrolled in Education 101.

The Moody-Godley Auction Co. of Darlington donated a \$1,000 scholarship for a freshman student majoring in Agricultural Education. The scholarship is renewable up to four years, provided the recipient performs satisfactorily. This type of cooperation by busi-

ness and industry has a very positive influence on the quality of the Clemson student.

## COLLEGE OF ENGINEERING

The College of Engineering experienced strong growth in each of its areas of instruction, research and public service during the year. Despite a recession-minded economy, the College had an upturn in enrollment, a record year for new research funded by external sources and substantially expanded public service activities.

Energy, environment and transportation crises created a strong demand for engineers at all levels. Nationally, the demand for engineers during 1974-75 exceeded 55,000 while the supply was less than 45,000. Engineering graduates garnered more than 50 per cent of jobs offered by industry despite the slowdown in recruiting efforts. Starting salaries for engineers reached an all-time high of more than \$1,200 per month.

Public concern with solving the technological difficulties associated with energy alternatives, the environment, crime, resource development and other problems has created a sizeable increase in student interest in engineering as a career. The College had a freshman enrollment increase of more than 20 per cent from 1973-74 to 1974-75, setting the total College enrollment at about 1,300. Accepted freshmen and transfer applications for 1975-76 are up 19 per cent from 1974-75 (or 40 per cent above 1973-74).

A public information program was initiated to inform South Carolinians of some of the College's activities. Privately financed television public service announcements as well as "Engineering," the quarterly College of Engineering Newsletter, have been effective methods in telling the public about College activities.

The first of a series of Guidance Counselor Workshops was held during March 1975. During this workshop engineering career guidance discussions helped 25 high school counselors to better understand engineering as a career, which will, in turn, help them to better serve high school students interested in engineering. Additional workshops are scheduled for 1975-76.

The first College of Engineering Open House was held on the weekend of the Clemson-Carolina football game with 7,000 people attending, including 2,200 high school students. The visitors participated in or viewed more than 100 engineering exhibits and demonstrations, including extensive student design projects in the energy, health, environment and transportation areas.



Forty-three women were enrolled in the College, an increase of 22 per cent over last year, and applications accepted for women in 1975-76 show a 72 per cent increase over 1973-74.

The national economic decline of the past two years has focused attention on the traditional stability of career opportunities in engineering and the need for greatly accelerated technical advancements necessary to maintain U. S. leadership in the world market. The College is responding to these pressures through new directions in each of the programs in instruction, research and public service, some of which are described briefly in the following material.

## **The Academic Program**

### *Instruction*

Modern methods of individualized instruction are being used by all departments in the College of Engineering. A special laboratory with 32 student stations, developed during 1974-75, will be doubled in size during 1975-76. Professor Gilbert Rainey from Purdue, a national authority in individualized instruction, was on campus last year designing a complete facility which assisted the College in its efforts in this area. One-third of all Engineering students were involved with these improved instructional methods.

The College's computer capabilities remain among the strongest in the Southeast and will be significantly expanded again this year through a \$20,000 equipment grant from the National Science Foundation. Computer facilities include a powerful real-time/hybrid system, an interactive conversational computer system, a time-shared system and 10 other micro- and minicomputer devoted to instructional and research activities. Clemson is a recognized leader in the applications of computers in Engineering with a strong faculty and more than \$1 million in state-of-the art equipment, almost all of which was purchased from Federal and private grants and contracts.

The College has increased its interactive computer-based instructional capability by establishing a second "computer classroom." A total of 30 stations are available for individual or class study in most Engineering disciplines. The College has acquired, through a special grant, one of the first "Classic" (Classroom Interactive Computer) terminals produced in the nation. The terminal is one of the easiest-to-use, lowest-cost programmable computer instruction systems currently available. Addition of the Classic terminal increases the College's research capability in searching for

the most cost-effective, computer-based instruction system for use at the secondary school level. It also strengthens the College's position of leadership by providing the most modern instructional and research facilities available.

Now in its fourth year, the high school interactive computing program serves five high schools in Greenville and Spartanburg counties. In addition six computer workshops were attended by almost 200 students. A special two-week session for bright but financially disadvantaged South Carolina students was especially effective. The program was sponsored by the Office of Economic Opportunity of the Department of Labor.

Real-world engineering problems, as defined by industry engineers, are addressed and solved by teams of undergraduate engineers in student design project courses. Student projects included devices to aid the handicapped and to provide solar energy for home heating, and the design of computer vehicles. In the Department of Mechanical Engineering student-designed devices such as a self-cleaning bathroom and a universal door lock won regional and national recognition at the Armco Steel Competition and the American Society of Mechanical Engineers Conference. Students in the Department of Electrical Engineering examined the feasibility of small two-person commuter vehicles for their suitability and acceptability to American consumers.

Recent industrial participants in student-design projects included American Enka, Armco Steel, Texize Chemicals, Intech Corporation and Barbeque King.

College baccalaureate degree recipients in 1974-75 included 12 graduates with high honors and five with highest honors. Forty-four Engineering students participated in the University Honors Program. A total of 60 College and departmental scholarships and awards were given during the year. Two of the University's 16 R. F. Poole Alumni Scholars are enrolled in the College.

### *Degree Program*

A total of 275 degrees were awarded by the College of Engineering during 1974-75. Undergraduate degrees are offered in eight engineering areas in addition to Engineering Analysis and Engineering Technology. The Master of Science degree is offered in 12 fields, the Doctor of Philosophy in nine. The professional Master of Engineering degree is available in eight fields.



### *Master of Engineering Program*

Graduate education for engineers throughout South Carolina will be available through an off-campus option in the Master of Engineering Program. Initiated in 1970, the professional degree program will utilize advanced individualized instruction techniques with peer-group reinforcement to make graduate engineering education practical for engineers regardless of their geographic location. Mechanical and Electrical and Computer Engineering degree programs will be available initially.

### **Research**

Energy, environment, economy and basic human needs are exceedingly complex; changes in any one affect the others. Engineering addresses these areas individually and collectively through faculty researchers.

The College's research expenditures from all sources increased approximately 30 per cent from about \$1 million last year to approximately \$1.3 million this year. Total research and grants-in-force exceed \$4.5 million, up more than 20 per cent over the previous year. A total of \$1.3 million in new research was awarded to College faculty this year, increasing total research grants, contracts and gifts to more than \$8.3 million since 1960. The College's research program has grown from \$20,000 in 1964 to \$4.5 million in 1975. This strong program of research strengthens and complements engineering's instructional program and provides South Carolina with the technical resources required to cope with serious problems in energy, productivity, environmental protection, health care and others.

### *Energy*

Because of the national energy crisis and its serious ramifications for South Carolina, College faculty are researching means of attaining energy independence as well as alternatives to conventional energy sources. A prime candidate for use in heating homes, businesses and industry is solar energy. Faculty members have developed a solar heated mobile home which may be a model for future developments in mobile home heating. A mobile home specifically designed for flat-plate solar heating with water reservoirs for thermal storage—and valued at \$4,500—was donated by the Polaron Corporation. Faculty members also are actively pursuing low-cost solar energy systems to provide most of a home's heating needs.



Mobile and conventional home heating appear to pose the same problems. However, structural considerations involved in the energy storage units needed for cloudy days require significant engineering investigation.

Solar heating of process chemicals and process water, being studied under a \$62,000 Energy Research and Development Agency grant, may reduce the energy needs currently met with gas or oil. Mechanical, Chemical and Systems engineers are teamed to address this problem. This potential application is important to the South Carolina textile industry, users of large quantities of heated process water. Use of solar energy in these areas will move the State closer to its goal of energy independence.

Significant programs in energy conservation continue in the recovery of process chemicals and energy through modern wastewater treatment research. Through the use of a \$100,000 mobile laboratory, hyperfiltration systems have been successfully demonstrated to be effective in recovering chemicals and cleaning water sufficiently for reuse, thus saving chemical and energy costs. Savings can pay for treatment in a short time, making pollution control profitable rather than painful.

Energy alternatives research includes gasification and liquification of carbohydrates into hydrocarbon fuels. Researchers are examining optimal use of existing conventional oil and coal-fired steam electric power plants. Other efforts include fundamental process design for energy conservation, hydro-electric pumped storage simulations and most efficient use of internal combustion engine emission controls. Six grants and contracts totaling more than \$320,000 deal with the State energy problem.

### *Environment*

South Carolina's environment will be maintained at a high quality level, partly because of research in the College. Effective and efficient pre-siting environmental studies are assisting industries in understanding the natural or base-line quality of the environment in the Piedmont. These studies will aid designers of pollution control equipment to maintain this quality.

State-of-the-art physical-chemical treatment methods, including hyperfiltration techniques developed in the College, are already reclaiming chemicals and hot water, providing savings for industry. A recent textile mill installation of a polyvinyl alcohol recovery unit will pay for itself while reducing stream pollution. The textile industry is using the \$100,000 mobile hyperfiltration laboratory

supported by the Environmental Protection Agency to explore the technique as a pollution reducing tool.

The use of process wastes for the manufacture of building materials, the training of wastewater treatment plant operators, electrostatic precipitator optimization methods for reducing air pollution and coastal beach stabilization to prevent erosion are other examples of College environmental research efforts. Grants for these projects total more than \$500,000.

### *Basic Needs*

The average South Carolinian is vitally concerned with energy and with his basic needs of food, clothing, medical aid and shelter. With inflation placing an increasing burden on the consumer, College researchers are examining ways to meet these basic needs at minimum cost.

Engineering methods applied to agricultural problems are resulting in harvesting and processing systems for fruit and vegetables which increase yields and reduce processing losses and costs. Shrimp mariculture, being studied under a \$38,000 grant from the Sea Grant program, provides the potential for an expanded supply of quality shrimp at prices competitive with naturally harvested shrimp.

Engineering in medical research has resulted in successful artificial teeth implants, artificial elbows and other prosthetic limb devices as well as bone caps for juvenile amputees. Ongoing computer research includes the design of automated anesthesia systems and computerized diagnostic screening.

College of Engineering faculty are involved in collaborative research with more than 25 medical and dental institutions, including the Medical University of South Carolina, Medical College of Georgia, Harvard University, Shriners Hospital for Crippled Children, and Moore Orthopedic Clinic. Medically related grants-in-force total nearly \$600,000.

The College's basic housing program is recognized as a leader in the field with Clemson being chosen to host the "1976 International Housing Symposium." Construction of low-cost modular housing under this program in South Carolina began in 1975 with eight homes built in Beaufort, Camden, Moncks Corner, St. George and Walterboro. Home costs will be less than conventional homes while still providing attractive, sound construction. Housing related grants-in-force total more than \$150,000.



Textile systems engineering studies are improving quality control methods in the textile industry, increasing product yields and reducing costs to the consumer while maintaining acceptable profit margins. Basic textile systems research totals more than \$1 million in terms of grants-in-force.

### *Transportation*

Research conducted in rail vehicle dynamics at Clemson will result in improved mass transportation systems. Basic designs of vehicle suspension systems and their behavior on various track configurations will lead to better vehicle and rail designs. Improved high-speed rail systems are the goal of this work. Two grants from the Department of Transportation totaling \$116,000 support the research.

Other transportation studies underway include work on effective traffic control through uniform traffic control devices and fundamental research on highway construction materials.

## **Public Service**

### *Continuing Engineering Education*

In recent years new technological and industrial developments have made it essential for the engineer to continue learning throughout his career. He finds that if he stays at one level of knowledge he will fall behind rapidly. Engineers today recognize that participation in continuing engineering education programs provide a period of concentrated study vital to career development. Recognizing its obligations, the College of Engineering has devoted an increased portion of its resources to such public service programs. The rapidly increasing demand for short courses, seminars and other public service programs has resulted in a sixfold increase in enrollment in Continuing Engineering Education programs during the past three years. Last year 9,076 engineers and other professionals enrolled in the 296 programs administered by the College.

About 75 per cent of these "public service students" were from South Carolina, representing every county, every large city and most smaller communities. The campus for these programs covers the entire State. Courses were taught at 11 cities throughout South Carolina selected for maximum convenience to the participants.

Since Continuing Engineering Education programs were initiated in 1967, more than 20,300 engineers and other professionals have enrolled. The demand continues to grow.

### *Professional Support*

During the past year all major segments of South Carolina industry were direct beneficiaries of the technical resources unique to the College. Responding to the needs of textiles, chemical processing, construction and health care involved more than 300 man-days of professional service. The year also was marked by an ever-increasing interest in student design projects—a cooperative activity where faculty, students and practicing engineers join in applying technology to the solution of real problems in industry. In addition, the programs and activities of 49 governmental agencies provided 410 man-days of technical advice and faculty participation in various councils and committees.

Also, a new pilot program has been organized by the Alumni Visiting Professor Dr. Thomas Burke to improve techniques for identifying and evaluating various needs in the public domain, such definitions being basic to technical solution with existing resources of the College. The preliminary phase of the pilot study, which focused on the Trident Region, involved initiating more than 60 on-site meetings with a cross-section of governmental agencies and industries. These meetings have been well received, with results varying from establishment of new short courses to reciprocal campus visits with College faculty. Perhaps most significantly, new or improved communication ties have been established with each of these organizations.

The pilot study also has provided insights useful to planning and future development of the College's public service efforts. Many of the needs expressed during these on-site visits extend beyond traditional engineering disciplines, a key factor which must be taken into account in formulating solutions to meet these problems.

### **COLLEGE OF FOREST AND RECREATION RESOURCES**

Teaching, research and public service are the three functions of the College of Forest and Recreation Resources. Substantial progress was made during the year in these three mutually interdependent areas.

#### *Teaching*

The student is always our primary concern as an educational institution; instruction in forestry, recreation and park administration and wood utilization is our major function.

College enrollment was 765 students in the fall of 1974, an increase of 10.4 per cent over 1973 and a 67.8 per cent growth since



the college was established four years ago. In addition to the increase in the number of students, the quality of students continues to improve. More and more have earned scholarships, some won in national competitions. And too, there continues to be a small, but steady enrollment of students who have earned degrees in other fields but seek an additional undergraduate degree in one of the College's curricula.

Because of tight program budgeting resulting from State and national economic conditions, the dramatic increase in numbers of students has caused some problems. By necessity classes have been split into multiple sections where teaching loads permit, but class sizes in some senior-level courses have reached 50-60 because of the lack of faculty members to teach additional sections.

The steady climb in enrollment indicates an awareness by young people that career fields in the College of Forest and Recreation Resources are rewarding, action fields. However, a steady-state point in optimum numbers of undergraduate students may be near, considering resources available and job opportunities.

There have been substantial increases in course offerings and enrollment in undergraduate recreational sports and activities service courses.

Graduate education, particularly in the Department of Forestry, was purposely restrained in prior years because of the lack of physical facilities. This is changing with the availability of facilities in the new Forest and Recreation Resources Building, to be completed in 1975. There has been increasing interest in the graduate programs, as reflected in a rise in the number of inquiries and in applications for admission. It is anticipated that graduate enrollment will increase significantly during the next several years, and employment opportunities should be good.

Plans have been completed to offer a series of graduate courses in Charleston, leading to a Master of Recreation and Park Administration degree. All accepted participants in the program are full-time professional park or recreation employees who would not otherwise have the opportunity to pursue a graduate degree. As the need arises, similar programs will be arranged in other geographic areas of the State.

### *Research*

A careful study was made in 1973 of the future research and extension needs in the Department of Recreation and Park Admin-



istration. Projections were made based on needs shown in the study. State funds are now being allocated toward meeting the projected needs. The funding has been used more efficiently through cooperative efforts undertaken with the U. S. Forest Service, the South Carolina Department of Parks, Recreation and Tourism, and other groups or agencies.

With the exception of a bicentennial-oriented study that provides a historical review of recreation in South Carolina prior to 1900, most of the faculty investigative work has been in applied research. Studies have focused on user profiles with Lake Hartwell and the Chattooga River. One study with current relevancy presented a regression equation which forecasts energy consumption differentials for campers. Another study dealt with the Bachman Warbler, an endangered species.

In 1970 the Department of Forestry made an in-depth study of the State's needs for forestry research information and how the Department could meet these needs. Goals for both research and extension forestry were established, and long-range plans were made for the orderly development of manpower, physical facilities, equipment and graduate student support required to meet these goals.

In this study cooperation was established as the hallmark of the Department's forestry research program. Cooperation has become a reality. Last year the Department initiated research projects with many units of the University: the Departments of Agricultural Chemical Services, Agricultural Engineering, Agronomy and Soils, Entomology and Economic Zoology, Plant Pathology and Physiology, Poultry Science, Chemistry and Geology, History and the College of Engineering. Three cooperative projects were initiated with the U. S. Forest Service. Industry is supporting additional work as has the Soil Conservation Service, the South Carolina Coastal Zone Planning and Management Council and the Water Resources Institute. Cooperative research with other colleges in the State has been initiated through a grants program of our Belle W. Baruch Forest Science Institute. The first of these was made through The Citadel to Dr. Richard D. Porcher Jr. to "determine the history and pattern of land use of Hobcaw Forest."

Significant opportunities for cooperation were provided by the Belle W. Baruch Forest Science Institute through the signing of the historic tripartite agreement among The Belle W. Baruch Foundation, the University of South Carolina, and Clemson Uni-

versity. This agreement brings these institutions together in a commonality of purpose and effort in providing research and education for citizens of the State.

Cooperative research has been strengthened within the Department by employing extension forestry personnel who have research responsibilities as well as public service responsibilities. Most of the appointments carry 70 per cent extension and 30 per cent research responsibilities. Four of the seven extension foresters have joint appointments; the other 3 devote 100 per cent of their time to extension activities.

### *Public Service and Extension Activities*

Extension forestry responsibilities cover a broad spectrum of activities. These range from more than 1,600 tree problems that were answered by extension foresters at five plant problem clinics to the marketing and utilization data collected by the S. C. State Commission of Forestry and Clemson Extension Forestry. Resulting from this information were a release on commodity drain, a publication on bark residue availability in the State and a timber buyers' guide. In addition, workshops were held for contractors who provide reforestation services to landowners. Television and other media releases were issued to stimulate and inform the public on the need to regenerate forest lands.

Another important communications effort is the Forest Landowners Newsletter, a publication relating to a wide range of forestry information which goes to more than 4,000 people in the State. Continuing education is another method of keeping people informed. Short courses on hardwood log and lumber grading, forest management, and forest taxation were conducted by extension foresters.

Youth activities have always been a rewarding part of extension forestry. Working with 4-H groups, Boy Scouts and other similar organizations as well as with their teachers and adult leaders has lead to a more responsible and informed populace who is more cognizant of the need to conserve natural resources.

The development of the first phase of the Recreation-Outdoor Education Research Laboratory has resulted in an improved program of teaching and public service in the Department of Recreation and Parks Administration. The Laboratory's nearness to main campus will become increasingly important as new activities are begun and ongoing programs are expanded. The facility's potential



to support a research program will become more evident as funds become available.

Camp Logan, a residential treatment program for emotionally disturbed children, was conducted at the Laboratory as were Camp Hope, a program for the retarded, and Camp Sertoma for the underprivileged. One very significant activity included was the planning and organizing of the Bike Hike for Pickens County which netted about \$5,000 for programs for the mentally retarded, nursing home recreation programming, and trail development at the Laboratory. The faculty is in accord that practical experiences which require substantial personal involvement are excellent instruments for teaching and learning.

Registration this year for College Week for Senior Citizens exceeded 600, more than 100 of whom could not be served. Because of increasing interest, plans have been made to add a third week to this popular program. Very few programs have the potential to exceed College Week in terms of educational and service opportunities. Camping for Senior Citizens will be expanded as units of the Outdoor Laboratory are completed.

## **COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE**

Relevancy is certainly a much overworked word. Still, it demands usage to accurately describe the dominant characteristic of the activities of the College of Industrial Management and Textile Science in the 1974-75 academic year.

Relevancy to the real-life world, to people and their needs is the framework within which the College structures its programs in teaching, research and public service. They are, in reality, people programs.

Relevancy is the word. Consider some examples:

- In April, 22 outstanding students visited the New York City headquarters of the textile industry giants for a firsthand look at their marketing, merchandising, financial and planning activities. The J. E. Sirrine Textile Foundation financed the trip to enrich the classroom experiences of the 18 undergraduates and four graduate students.

- In the research laboratories, a team of textile chemists is seeking a commercial flame retardant for cotton polyester apparel fabrics, an elusive technological prize that would not only provide improved consumer safety but also would aid the textile industry



in meeting pending government regulations on clothing flammability.

- Timely significant short courses and seminars continued to be the hallmark of the Professional Development Program. Overflow enrollments and the necessity of repeating programs to accommodate all applicants indicated the Professional Development Program was giving business and industry what it wanted. Several courses were tailored exclusively for the needs of an individual company or state agency. They were relevant; they were successful.

These examples clearly show that recognition of the important role of this College and the contributions it continues to make to the State's industrial picture has come in many forms. Especially noteworthy is the vote of confidence from the J. E. Sirrine Textile Foundation.

In 1974-75, financial support from the Sirrine Textile Foundation totalled \$78,000. And the Foundation has already approved a commitment of funds totalling \$135,000 through 1977. This support makes possible such activities as the New York trip discussed earlier, and other special projects to reward and recognize scholastic achievement as well as participation in student organizations of the College.

In the fall of 1975, a \$5,000 appropriation from the Sirrine Foundation enabled the College to present distinctive blazers to more than 100 outstanding students who displayed exceptional academic standing and student organization leadership.

A much broader view is represented by these glimpses of various aspects of the College. Following is a more detailed look at each of the College's four departments. Also highlighted are the activities of the Office of Professional Development and College-wide research.

### *Department of Textiles*

This Department essentially serves the nation's textile industry and especially South Carolina's textile industry, the largest industry in the State. In carrying out its mission, the Department offers three undergraduate degrees: Bachelor of Science in Textile Technology, Bachelor of Science in Textile Chemistry, and the Bachelor of Science in Textile Science. The master's degree and the Ph.D. degree are offered in Textile Chemistry, Textile Science, and Polymers.

A special State appropriation of \$273,000 for textile laboratory equipment provided a strong boost to the Department's capabili-

ties in research and graduate teaching. Major items purchased included a Suessen Open-end Spintester (a recent innovation in yarn spinning technology), a Saco-Lowell Rovematic Roving Frame, now accepted as the standard machine of the industry, a Fiber-Locker Needle Punch, used as a teaching aid in nonwoven fabric production, and a Millipore Camera which projects on a visual screen particles which differ in color from the background.

A Digital Equipment Computer, used initially in cotton dust research, and a Liquid Chromatograph, which allows the separation of components mixed together, are other new additions. Also purchased were a DuPont Thermal Analyzer, Varian Spectrophotometer, and Perkin-Elmer Corrected Spectra Accessory. Partly because of having this equipment, the Department has been awarded contract research for many projects.

#### *Department of Industrial Management*

Enrollment in both undergraduate and graduate programs of this Department has increased, with growth in the undergraduate program exceeding 10 per cent during the year. The Master of Science in Management program and the Ph.D. programs in Management Science and Engineering Management noted similar related enrollment growth as did the Clemson-Furman University Master of Business Administration program which continued to provide a valuable service to Piedmont area industry and business.

Department curricula have been revised based on the results of an analysis made by industrial personnel, students and faculty. More economics courses and more emphasis on human resources and labor laws are reflected in the revised curricula.

In response to the growing importance of expertise in occupational safety and health, a new minor concentration in this field was made available under the Bachelor of Science degree program in Administrative Management. This option was made possible by a two-year, \$105,000 grant from the Department of Health, Education and Welfare.

#### *Department of Economics*

The nation's economic health was in poor condition during the year, but interest in the subject was never better. Student enrollment reached new highs, with more than 1,600 taking courses in the spring semester. At the graduate level, enrollment also increased with 12 students in the Department's M.A. program.



Promoting a better understanding by the general public of economic problems and their causes was an important activity of the Department. Weekly newspaper columns on timely issues were written by Department faculty and published on the editorial page of "The Greenville News."

Also, the faculty developed and presented three public forums on key economic issues—inflation, recession and energy. Response from students, faculty and the community was enthusiastic.

Several programs on economic issues were broadcast over the State's educational radio stations, and a number of special news releases was written by the faculty. Fifty prepared speeches were delivered by faculty members before civic clubs, professional organizations and public meetings throughout the state.

Emphasis continued on the consumer economics course developed for Clemson students. Interest from area adults prompted the offering of this course in the evening and a special series in the Adult Education Program. Response was good.

Faculty activities reflected their professional growth. Biweekly workshops on economic research were held in the Department to give faculty an opportunity to try out new ideas, present tentative research findings, and, in general, keep up with the growing edge of economics. Eighteen academic manuscripts were written by faculty and submitted to national and international professional journals.

#### *Department of Accounting and Finance*

This is the newest Department within the College. It was established July 1, 1974, to administer programs leading to the Bachelor of Science degree in Accounting and the Bachelor of Science degree in Financial Management.

Enrollment in accounting and finance courses has grown for the past several years. About 3,300 students participated in the 100 sections of these courses during the year. Most of the students were majors in Accounting, Financial Management, Administrative Management and Industrial Management, but a substantial number of students from other majors were included.

In 1974, 28 students received a B.S. in Financial Management. The number of majors in the program exceeds 400 and is increasing, with 102 new freshmen accepted for enrollment as majors in the first semester of 1975-76. The quality of students entering the programs is extremely high. The typical student graduated in the top 10-15 per cent of the high school class.



Eleven of the Department's 13 faculty members are primarily in accounting, and include nine certified public accountants and two certified management accountants. The other two members are in finance and are the most recent additions. Seven of the 13 members have doctorates and six have master's degrees.

### *Office of Professional Development*

A phenomenal growth, both in enrollment and course offerings, was experienced by this Office. Even with the economic slowdown, enrollment increased by 48 per cent to 2,570 participants, while the number of courses increased by 82 per cent to 49. This last figure does not include courses that were repeated, which would bring the total presentations to 80 programs.

Seventy-four College faculty members sponsored or participated in Professional Development programs. There were 28 more speakers from industry and private consulting firms participating in the past year compared with 1973-74.

The substantial jump in the number of programs reflects two trends: timely topics such as the Occupational Safety and Health Act and Textile Printing and Texturing were pursued in greater detail with several intensive workshops; and new courses in such areas as Effective Time Management for the Secretary, Effective Time Management for the Executive, Chemistry of Dyeing, and Warehousing and Distribution were developed.

To take the Professional Development courses to some participants, 16 programs were held in major cities, including Columbia, Charleston, Greenville and Spartanburg. Several courses were presented exclusively for one company or state agency.

The Office continued to receive industry and government recognition. In October 1974 the "American Dyestuff Reporter" covered our activities in an article on continuing education in textiles. In the June 1975 issue of "Trends," published by the South Carolina State Development Board, this Office received wide recognition.

### *Research*

Answers to real-life problems—this is what research in the College is all about. This point is underscored by looking at some of the major projects in the \$1 million worth of research under way. The subject areas represent a list of the important problems confronting industry leadership, employees and the consumer.

Cotton-polyester flammability is the subject of a 26-month project initiated July 1, 1974, in the Department of Textiles. Financed by

a \$475,000 grant from the U. S. Department of Commerce, the study has three major technical goals: understand why cotton-polyester blends burn as they do, learn how various types of chemicals affect the burning, and develop a commercial flame retardant finish and define its technological feasibility.

Clemson won the contract with a consortium approach to the research. The group includes three universities, an institute laboratory, and three companies. Clemson is prime contractor with overall responsibility.

The research has the potential to provide South Carolina industry with new technology to meet pending government regulations on clothing flammability as well as make a significant impact on safety.

The cause and control of cotton dust, an investigation sponsored by the U. S. Department of Agriculture, continued. The experimental cardroom for these studies has been refined to the point that it is the model for most of the cotton dust work being done anywhere.

Results of the studies have been made available to industry and have been helpful to some companies in successfully defending court action on dust violation charges.

In the Department of Economics, funded research reached the \$200,000 mark. Projects concerned with economic growth in the Piedmont, labor supply in the fishing industry, water quality management, fiscal impact of recreational development, costs of the court system and allocation of state-owned wetland property were funded. Much of this activity was reflected in reports delivered to professional associations in economics.

Research efforts of faculty in the Department of Industrial Management have been directed toward the application of the Management Science method to industrial problems.

Other research continued in the areas of occupational safety and health, open-end spinning, cotton fiber measurements and evaluation, fabric finishes and polymer research.

## COLLEGE OF LIBERAL ARTS

A self-governing society requires of its citizens a basic general education that will enable them to lead full and useful lives and to contribute to the general welfare. An acquaintance with the humanities and the social sciences are a necessary part of the education of all who expected to play an intelligent and meaningful role in society.

Clemson University recognizes that a great educational institution must have a strong program in the humanities and the social sciences. From its inception in 1969, the College of Liberal Arts has enjoyed the strong support of all branches of the University.

### *Organization and Influence*

The College includes the Departments of English, History, Languages, Music, Political Science, Psychology, and Sociology. In July 1974 the Department of Political Science and Sociology became separate departments, completing the gradual organization of the College begun in 1969. All Departments except Music offer an undergraduate major concentration, and English and History offer the Master's degree.

Though only about 15 per cent of Clemson undergraduates major in Liberal Arts, the influence of the College is great, for approximately one-third of the teaching of the entire University is done by Liberal Arts faculty.

Sixty per cent of the faculty hold the doctorate; qualified graduates of the College readily enter outstanding graduate, medical, law and other professional schools.

### *Involvement*

One of the most important contributions of the College is sponsorship of student organizations and extra-curricular activities.

The Department of English sponsors the Clemson Players, the Debating Team, and assists with the management of the "Tiger" and the "Chronicle."

The Department of Music sponsors the Marching Band, the Concert Band, the University Chorus and the Liberal Arts Chamber Music Series; it also manages the University Concert Series.

The Department of Languages sponsors an annual Foreign Language Festival and a foreign-language declamation contest for high school students.



The Department of Political Science sponsors the University's Model United Nations Representation Team. It also managed in the summer of 1975 its third highly successful Robert A. Taft Seminar in Government and Practical Politics, which brought 30 public school teachers of the Social Sciences to Clemson for two weeks of discussion and training in public affairs. The Governor of the State, several other high-level state officials, and many local political participants and observers cooperated to give the participants the benefit of their experience and their views on public affairs.

The Department of Psychology sponsors a popular club for its major students. In addition, during 1974-75, members of its faculty managed the College's second annual Liberal Arts Lecture Series, which treated the theme of "Violence and Aggression in American Life" and brought to the campus a dozen nationally famed writers, movie directors, law-enforcement officials and scholars to discuss the subject. The sessions were made available by television to audiences throughout the state.

### *Professional Scholarship*

The "South Carolina Review," a journal of literary scholarship, fiction and verse, which is edited by a group of English faculty, continued during 1974-75 to attract additional readers and to bring favorable attention to the University.

The "Journal of Political Science," sponsored by the Department of Political Science, and the "Southeastern Latin Americanist," sponsored by the Department of History, continued their successful careers.

During the year three highly qualified scholars were appointed to head the departments of English, History, and Sociology. Still another noted scholar was appointed to fill the William James Lemon Professorship in Literature effective with the new academic year.

The College is extremely proud that one of its long-time faculty, Associate Professor of History Dr. Jerome Reel, won the 1975 Alumni Master Teacher Award, thus marking the second straight year the coveted recognition has been extended to the College of Liberal Arts.

### *The Future*

The encouragement of scholarship and the education of responsible citizens are the guiding principles of this College. All indica-

tions point to continued growth in the quality and scope of programs in the humanities and the social sciences, as well as to a greater consciousness of cultural matters in the general University life.

Research, teaching and public service activities of the social science units will be directed more and more to a search for solutions to problems of poverty, pollution, population growth, mental health and public administration.

Clemson University's College of Liberal Arts is a community of scholars and students for the study of man's basic needs and drives—intellectual, emotional, cultural and social.

### **COLLEGE OF NURSING**

Student population and programs in the College of Nursing have continued to grow. While space remains a major problem curtailing development of therapeutic involvement by nursing faculty and students in campus programs, a new building will be ready for occupancy no later than the 1978-79 school year.

Three hundred fifty-four students were enrolled in the baccalaureate program and 78 in the associate degree program last year. A total of 84 received diplomas; 28 received the associate in arts degree and 56 the bachelor of science degree.

Faculty recruitment continues to be a major focus and concern. We are fortunate in having recruited well-qualified professional people to give leadership to our programs. Dr. Imogene Cahill, a nationally recognized professional nurse-social scientist, joined the staff in August as director of the Graduate Program. The first graduate class will be enrolled in the fall of 1975.

The baccalaureate curriculum was enhanced by the addition of nursing electives. Students can register for courses of their choice during their last semester. Titles of these new courses are: Care of the Hospitalized Child with Long-Term Illness, Nursing Care of the Person in Crisis, Transactional Analysis and Nursing, Teaching Role of the Nurse Practitioner, Care of Individuals with Complex and Critical Illness Problems, Nursing Care of the Acutely Injured Person, and Introduction to School Health Nursing.

The Appalachian In-Service Education Project terminates on August 31, 1975. Through the very fine leadership and enthusiasm of Mrs. Suzanne Parks, coordinator, every hospital and nursing home in the six-county area was reached and their evaluations indicate



that the project was successful. Workshops were offered in Legal Aspects of Nursing, Standards and Quality Assurance in Provision of Nursing Care, Quality Assurance in Nursing Practice—Nursing In-Service Education in the Nursing Home, and Selected Problems in Industrial Nursing (co-sponsored by the S. C. Industrial Nurses Association).

A Pediatric Nurse Practitioner Program was initiated by the Greenville Hospital System, and the Medical University of South Carolina and Clemson. The project is supported by Area Health Education funds and the College of Nursing. Mrs. Ann Lukawecki, a faculty member in the baccalaureate program, was appointed co-director and her physician counterpart and co-director, Dr. William Weston, was appointed by the Greenville Pediatric Education Department and by the Medical University of South Carolina. The program provides continuing education to practicing nurses who are interested in extending their knowledge of child care. Upon completion of the program, nurses practice interdependently with pediatricians.

Other public service workshops which involved the faculty were Nursing Concepts in Community Health, for 26 public health staff nurses; and Leadership in Community Health Nursing, for 41 team leaders employed by the Nursing Division of the Department of Health and Environmental Control. The workshops were led by Dr. Arline Duvall, assisted by visiting instructors.

Mary Wagner, assistant professor, conducted three short courses in Emergency Room Care for Registered Nurses. The program was sponsored by federal grants from the Department of Health and Environmental Control.

### COLLEGE OF SCIENCES

The College of Sciences (formerly the College of Physical, Mathematical, and Biological Sciences) in academic year 1974-75 continued to handle one-third of the total teaching load of the University. Approved for the College was a new B.S. degree program in Biochemistry to be offered beginning the fall of 1975. Construction of Jordan Hall, a facility to provide 90,000 square feet for laboratories and research in the biological sciences, was begun in October and is progressing on schedule. There has been a noticeable trend recently for college students to select the sciences as a major field of study. Undoubtedly, their concern over the environment, pollution, energy and health affairs has led to a heightened



interest in the sciences where the capability exists for the solution of these major problems.

### *Botany*

Enrollment in introductory Botany remained at a high level and increased in advanced courses. To replace teaching time lost by a faculty member who served as president of the Faculty Senate, the Department had a visiting assistant professor for one year. The faculty added one permanent member, an experimental systematist.

Three faculty members received research grants from external agencies. Their projects included studies of the effects of thermal stress on primary productivity in a lake, evaluation of an aquatic fungus for use in the biological control of mosquitos, and an investigation of photosynthesis in an alga.

The Department continued a plant identification service and the maintenance and enlarging of the University Herbarium. Numerous plant specimens submitted by both county agents and the public were identified. Several faculty members presented talks at other colleges, as well as to garden clubs and environmental groups in the state. Several faculty members participated in national conferences dealing with pertinent national and international biological, health and environmental concerns.

### *Biochemistry*

The Department of Biochemistry continued to grow at the rapid rate evidenced since its establishment in 1971. There were 819 students enrolled in biochemistry courses and 22 in the advanced degree programs.

Faculty research efforts were highly successful. Eight seminars were presented at other universities, 15 papers were presented at regional meetings, seven at national meetings and 14 manuscripts were published. The Department obtained three research grants, one from a commercial company, one from the National Science Foundation and one from the National Institutes of Health.

The faculty exchange with the Medical University of South Carolina continued to be received enthusiastically.

The Department hosted the Ninth Annual Regional Lipid Conference in October. Fifty-five researchers attended; 20 papers were presented.

CLEMONS UNIVERSITY LIBRARY

Eighteen researchers from other campuses throughout the country visited the Department to present seminars.

### *Chemistry and Geology*

The Department of Chemistry and Geology made significant progress toward its goal of developing a distinguished faculty. Two replacement positions were filled by young teacher-scientists with outstanding credentials and whose specialties, theoretical chemistry and chemistry of the non-metallic elements, complement the present research and teaching activities of the Department. Two faculty members conducted sabbatical research and study. Others participated in technical conferences designed to up-date the scientific knowledge of participants.

As an outgrowth of the Department's commitment to strengthen programs to meet the needs of its students, the curriculum leading to the B.S. Degree in Chemistry was revised. The new curriculum retains the solid core of chemistry courses identified with a strong program in chemistry and meets the requirements of the American Chemical Society for certification of graduates. It now also provides a means for students with career objectives that require foundations in chemistry and one or more complementary disciplines, to take a larger and more specific cluster of courses, beyond the chemistry core courses.

The Department's most visible deficiency in meeting student needs is its lack of an M.S. degree program in Geology. The M.S. degree is rapidly becoming the degree of most practicing geologists. A proposal to establish the degree program is being submitted.

Research emphasizing fundamental advances in chemistry and geology was continued. The success of the research is evident in the active reporting of results by faculty at international, national and regional meetings, and in leading professional journals. Co-operative research has been fostered. Increased interaction with industrial laboratories resulted in four contracts involving faculty members and South Carolina industries. Two of these were in co-operation with scientists and engineers in other units of the University. Research was also begun in collaboration with scientists at other colleges and universities, *e.g.*, the University of South Carolina, South Carolina State College, and Imperial College, London.

More courses were offered for secondary teachers during the summer. The High School-College Interface Conference was again



successful in bringing together from both levels teachers interested in better chemistry instruction.

### *Mathematical Sciences*

The Department of Mathematical Sciences continued to offer a comprehensive approach to Statistics, Computer Science, Operations Research, and Core Mathematics. The computer influence was indicated by more than 2,000 student jobs per day in the Martin Hall Remote Computer Center. Adjacent lecture rooms are also used extensively as computer study labs. The Department will be strengthened significantly by five replacement faculty members whose research interests better align the Department with its dynamic programs. They will add additional expertise in Computational Statistics, Operations Research, and Computer Science. Collectively, they bring degrees or faculty experience from Massachusetts Institute of Technology, Cornell University, Southern Methodist University, University of Chicago and the University of Maryland.

The Department received approximately \$82,000 to support research projects by six professors. Nine other faculty members received grants to participate in week-long research conferences. The University hosted, with \$20,000 of outside funds, an international conference on "Computing Fixed Points and Applications." In addition, the University and Washington State University received substantial grants for a cooperative program to develop new approaches in graduate education in mathematical sciences. These are two of only three such national awards to mathematics departments. The grants cover a three-year period, and national attention has already been generated by the programs.

The faculty continues to gain national recognition by appointments to positions in major organizations. Three members serve as visiting lecturers for the Mathematical Association of America, the Society for Industrial and Applied Mathematics, and the Mathematical Association of America's Committee on Undergraduate Programs in Mathematics. The Society for Industrial and Applied Mathematics Visiting Lecturer Program for the southeastern region is coordinated by a Department professor, while another serves as chief reader for the Educational Testing Services in the College Board's Advanced Placement Program in Mathematics.



### *Microbiology*

The Department graduated 42 students—34 with B.S. and eight with M.S. degrees—the largest number for the Department in one year. Many of these are continuing their studies in graduate programs, some have begun training for one of the medical or allied health professions, while others have obtained employment, mostly in South Carolina, with agencies like the S. C. Department of Health and Environmental Control, the Medical University of South Carolina and the S. C. Agricultural Experiment Station.

A wide variety of research projects were begun. One deals with the effectiveness of various antibiotics to control gonorrhea, a disease widespread in South Carolina. The results of another project suggest that if heavy metal ions, such as copper, zinc and mercury, are discharged into natural waters, such pollutants may prevent detection of domestic sewage pollution.

The salt marshes along the southeastern seaboard are of paramount importance to marine life and, therefore, to the fishing industries. The ecology of these marshes must be thoroughly understood if they are to be properly protected and managed. One investigator is studying how microbes in the marsh mud contribute to the overall ecology of the system. Special emphasis is being placed on the production of methane gas by the marsh.

Another problem under investigation is the repair of biological genes damaged by ultraviolet radiation. This research is pertinent to solar radiation damage of human skin cells and the development of skin cancers.

A bacterium that rapidly decomposes cellulose at high temperatures is under investigation. The research findings are relevant to the disposal of solid wastes rich in cellulosic materials, *e.g.*, paper and cardboard.

Other projects include attempts to produce a type of cheese product by fermenting peanut emulsion, a study of the effect of temperature on the survival of a pathogenic bacterium found in seafood, and the degradation of herbicide chemicals by soil microorganisms.

### *Physics and Astronomy*

The Department of Physics and Astronomy, assisted by a \$33,245 grant from the National Science Foundation, conducted a summer institute for high school teachers in 1975. Recent surveys indicate the level of formal preparation of high school physics teachers in

South Carolina is well below the national average. The Clemson Summer Institute for Physics Teachers, the third held in recent years, is the latest step in a continuing effort to correct this problem. The Institute helps provide physics courses for the high school students that will give them a better understanding of this fundamental science and lay a better foundation for subsequent technical and scientific training. This year 26 teachers participated in the eight-week program, which involves the subject matter and instructional techniques associated with a standard high school physics course developed at Howard University and known as "project physics." During the past two years the program has given about 25 per cent of the high school physics teachers in South Carolina the training necessary to teach the "project physics" course.

The Department's planetarium, the only university facility of its kind in the State, expanded its level of activity in providing astronomy instruction for school children, university students, and as a continuing education program for the general public. Apart from its use as a University instructional tool, 147 presentations for 4,000 public school students and adults were held, nearly double the attendance level of the previous year.

### *Zoology*

In response to increased teaching loads, three faculty members were recruited for the 1975-76 academic year. One faculty member was on sabbatical leave conducting research at Oak Ridge National Laboratory.

Several department members were engaged in sponsored research. One project involved work on roosting movements of black-birds related to bird-aircraft collision problems. A LN66 radar was acquired on permanent loan in connection with this study. Two other projects concerned water quality and lake ecology. The Department, in cooperation with the Department of Textiles, continued studies of byssinosis. Several faculty members contributed to the preparation of environmental impact statements for major construction projects planned for the Piedmont area.



## GRADUATE STUDIES AND UNIVERSITY RESEARCH

### *The Graduate School*

During the first semester of the year, 22.3 per cent of the Clemson University student body was enrolled in the Graduate School, an increase of one per cent from the previous year. Off-campus enrollment was 955, 823 of whom participated in special classes offered for elementary and secondary school teachers, and 132 enrolled in the joint Clemson-Furman MBA program. Spring semester enrollment reflected a record 3,032 graduate students. This represented 28 per cent of the total student body. Forty-six per cent of these students were enrolled in off-campus classes, including 138 in the MBA program.

Enrollment in doctoral programs continued at about 200 students, as it has for the past several years. Substantial growth has occurred in the professional master's degree programs, which now represent 50 per cent of the total Graduate School enrollment.

During the year, 663 advanced degrees were awarded, an eight per cent increase compared to the previous year. Doctoral degrees accounted for 47 of these degrees, and 17 Specialist in Education Administration certificates were awarded.

No new programs were approved this year, and the review of existing graduate programs was held in abeyance pending a response to the report submitted last year to the South Carolina Commission on Higher Education. The Graduate Council did undertake, at the request of the dean of the University, a study of duplication of effort in the teaching of graduate courses. The Council also investigated courses seldom offered and those with consistently low enrollments. This report has been forwarded to the dean of the University for review by the Council of Deans.

Other actions taken by the Graduate Council were the approval of a nonthesis option for the Master of Arts degree in English, a review of admission standards for the Master of Sciences, Master of Arts and Ph.D. programs, and a recommendation concerning residency requirements for employees of Clemson enrolled in advanced degree programs.

### *Office of University Research*

The Office of University Research serves faculty by disseminating information on sponsored research, training and public service opportunities, and by assisting with the preparation and submission



of proposals for such activities. The Office serves as the University's executive unit in the coordination and cooperation of activities with the Oak Ridge Associated Universities, the Southern Regional Demographic Group, and the Department of Health, Education and Welfare Office for Protection from Research Risk. It also is the executive arm of the University Research Council, the Faculty Research Committee, the Committee for Laboratory Animal Welfare and the University Sea Grant Committee.

A major responsibility of the Office is insuring University compliance with the Department of Health, Education and Welfare's Regulations for the Protection of Human Subjects. These regulations will be administered through this Office. Another major responsibility is the University Research Council duties and activities. Ad hoc committees are currently studying the problems associated with patents, copyrights and research duplication. The Faculty Research Committee became a standing committee of the new Council and awarded 20 grants on the basis of 29 faculty proposals received.

The following items illustrate the diversity and scope of sponsored research, training and public service activities during the past year.

1. The third consecutive Robert A. Taft Institute Seminar in Government and Practical Politics for South Carolina secondary school teachers.
2. The South Carolina Committee for the Humanities supported seminar series on American Violence and Aggression.
3. The National Institutes of Health supported training in Occupational Safety and Health.
4. The National Oceanic and Atmospheric Administration supported Engineering Support for Shrimp Mariculture.
5. The National Institutes of Health supported Direct Gel Scanning Studies of Pyruvate Kinase.
6. The Office of Naval Research supported Statistical Analysis Procurement research.
7. The National Science Foundation supported Project Physics Course Implementation for South Carolina secondary school teachers.
8. The Office of Naval Research supported Regional College Mathematics Research Conference.
9. The National Science Foundation supported research on the Boundary Layer Lipid of Cytochrome Oxidase.

10. The Army Research Office supported investigation of the transport defects in Alkali Azides.
11. The National Aeronautics and Space Administration supported research on Hyperfiltration of Wash Water.
12. The Appalachian Regional Commission supported Exceptional Individual Rehabilitation Plan.
13. The Coastal Plain Regional Commission supported Farm Management Education and Service project for special farm groups.
14. The National Center for Atmospheric Research supported Hail Research Data Analysis.
15. The National Science Foundation supported Simulation Processes in the Rhizosphere.

These grants represent approximately three-quarters of a million dollars.

### *Computer Center*

The growth in computer usage at Clemson has been explosive. Since 1969, when the campus computer facilities were meager, machine capacity has increased by a factor of five, and traditional programming work, known as "batch" work, has increased from 5,000 jobs per month to 55,000 per month. The Center also added a large and effective general purpose time-sharing system, and there has been a significant increase in the use of large online information systems.

The Computer Center has carried a workload far in excess of other installations of similar size and has made a significant achievement in reducing the turnaround time required to process small jobs. Sixty per cent of the batch jobs brought to the Center are now processed in two minutes. A further nine per cent takes five minutes, the next six per cent take 15 minutes, and ninety-one per cent of all jobs brought in are processed in one hour. The Center has handled as many as 3,335 jobs in one day.

This rapid turnaround has been the single most important factor in improving the Center's service. The increase in capability has been brought about through effective management with a minimum increase in cost. Computer services have been made more convenient both through faster turnaround of jobs, and by placing stations where batch jobs can be processed at several locations on campus.

There are currently 190 courses on the Clemson campus which depend on computer facilities. Of the batch jobs which are proc-

essed, 75 per cent relate directly to course work or to student-faculty research.

Perhaps the most dramatic change in the usage of the computer at Clemson has been the progressive use of a time-sharing system. It is the second most significant factor in improved service. In 1972, there were no time-sharing terminals supported by the Computer Center. Any users requiring time-sharing service had to go off campus or provide their own facilities. Today there are more than 400 time-sharing users that depend on the Clemson time-sharing system, and there are more than 50 time-sharing terminals on the campus.

The Computer Center is providing support to many different kinds of users, both on- and off-campus. The normal time-sharing load is approximately 30-40 simultaneous users during all hours of the day. These users enter approximately 20,000 transactions and inquiries per day which is the highest activity of any time-sharing system in the State.

The Computer Center is committed to two objectives which have impact off-campus. The first is to achieve national recognition for the work on campus. The Center has been able to do this by active participation in professional meetings and by establishing excellent relationships with other university installations out-of-state, and industry installations in-state.

The second commitment is to build the finest staff possible. In order to establish a staff as effective as any in industry, many of the key people in Clemson's data processing organization were recruited from industry. The recruiting base has been nationwide, and the Center has gathered a group of data processing professionals capable of promoting the effective use of computer systems at Clemson.

Because of Personnel available to it, the Computer Center has been able to promote the cooperative use of computer facilities throughout the Piedmont and State. Some of the systems under development for other agencies include:

- Public Health

- Health Planning

- Comprehensive Manpower Training

- State Pesticide Regulation

- Forestry Management Research

- Federal and State Grants Management



Land Conservation and Usage  
 Mental Health  
 Energy Management  
 State Development Board  
 Law Enforcement

The Computer Center's most recent addition has added new depth to its data processing capacity. The Center built a capability for supporting large scale online information systems which is more advanced than any in the State. It is the only one of its type in South Carolina. Some of the agencies using Computer Center services, together with the number of terminals in use, are:

<i>Agency</i>	<i>No. of Terminals</i>
Greenville County Health Department .....	19
Greenville General Hospital .....	5
Whitten Village .....	1
Greenville Department of Social Services .....	4
Greenville Social Security Administration .....	2
Greenville Department of Mental Health .....	2
Department of Social Services District Office .....	1
Family Court & Department of Social Services .....	6
Spartanburg General Hospital .....	8
Department of Corrections .....	1
Spartanburg Health Department .....	4
Easley Health Center .....	2
Pickens Health Department .....	2
Clemson Health Center .....	1
Central Health Center .....	1
Anderson Health Department .....	4
Anderson County Mental Health .....	2
Anderson Department of Social Services .....	2
Land Use System .....	2
Public Health System (Others) .....	21
State Development Board—Columbia .....	1
Division of Administration—Columbia .....	4

In addition to the State agencies using the Computer Center, other educational installations have begun to rely on Clemson for leadership and service in the area. Clemson is being used as a regional computer facility by Furman University, Lander College, Central Wesleyan College, Converse College, Greenville County High Schools and Oconee County High Schools.

Through the development of a new programming organization responsible for Management Information Systems, information systems are now being developed for use among the many administrative units on campus. In addition to the personnel commitment made to the project, a local terminal network is being installed which allows easy and cost effective attachment of computer terminals across the campus.

### *Administrative Programming Services*

The Division of Administrative Programming Services, created in July 1974, administers the information processing requirements of the University. The Division was formed in order to consolidate several diverse systems development activities into a single development group which is responsive to the policies and priorities of the University.

Its charter is threefold: to create and maintain operational information systems as are necessary for the daily operation of the University; to develop a University-wide data base as a natural by-product of these operational information systems; by using the data base as a foundation, to design and build a fully integrated management information system for use by the University administration as a planning and policy making tool.

The most significant accomplishment in Administrative Programming Services can be expressed in one word—management. An organization has been created with the necessary structure to allow the management of priorities in a manner responsive to University policy. Administrative Programming Services has organized the change level concept to provide for management of change. All existing systems are being brought under proper management control through documentation and operational standards. By organizing into programming teams with planned backup, programming standards and written systems specifications, the development process has been brought under management control. Finally, the management of production—the delivery of the service to a user—has been accomplished by establishing Production Services with standard job decks and standard documentation.



## ROBERT MULDROW COOPER LIBRARY

The Robert Muldrow Cooper Library added 35,919 volumes this year, increasing its total collection to 578,616. In addition, there are 31,468 microcards, 9,995 reels of microfilm and 190,368 units of microfiche. The Library receives regularly 10,682 serial titles; that is, periodicals received on a regular basis and transactions, proceedings and reports that are received shortly after being published.

To supplement its collection, the Library borrowed 1,981 items from other libraries. In turn, it loaned 1,996 items. This was the first year that the number of items loaned exceeded the number of items borrowed. The institutions from which Clemson borrowed most frequently in the fields of science, technology and agriculture were North Carolina State University, the Medical University of South Carolina and Duke University. In the area of social sciences and humanities, the University of South Carolina, University of North Carolina and Emory University provided the largest number of items requested.

The Library circulated 198,811 publications, an increase of 28,657 over the previous year. In an open-stack library such as Clemson where students have ready access to the total collections, it was been estimated that about six books are used in the Library for each one borrowed for use outside the building. There also was an increase in number of persons using the Library. The Library keeps a daily count of the number of persons leaving the building. The busiest month was April when a total of 61,948 persons left the Library during the 30 days that it was open—an average of about 2,065 per day.

Thirty-five researchers came to Clemson to use the papers in the Special Collections, 18 from South Carolina and 17 from 11 other states including California and Wisconsin. Also included was one visitor from each of the following countries: Canada, Germany, Italy and Japan. In addition to assistance to visiting scholars, which includes correspondence prior to their first visits to acquaint them with this Library's resources in their specific areas of interest, there are many other activities that are in progress daily: analyzing contents of collections, correspondence with persons requiring reference assistance, implementing special projects and the daily routines of special collections. It was a very busy year for special collections personnel. In addition to the constant use of the South



Carolina Room, researchers used 18 of the Library's special collections.

In its effort to make students aware of the resources of the Library and orient them to the building and services, the Library conducts a freshman orientation program. It consists of a lecture, which includes a slide-tape presentation, and is followed by an assignment in which a student must find his way about the collections and use various reference books. Eighty-nine classes were conducted in Freshman English 101. Eighteen classes were conducted for students at an advanced level including graduate students. Also, 15 sections (175 students) from the College of Nursing were provided special instruction in nursing literature and the use of reference sources.

In cooperation with the National Agricultural Library, a "Document Delivery Service" is provided by the Library. This service provides U. S. Department of Agriculture personnel within South Carolina with the publications that are available in this Library. During the year, the Library received 749 requests and was able to complete 70.3 per cent of these from material available in this Library. The service is fast and is appreciated. The remaining 29.7 per cent that had to be referred to the regional center at the University of Georgia indicated some weaknesses in the collection that must be rectified.

In March of 1975 after the College of Architecture library was moved into new quarters, policies similar to those of the Robert Muldrow Cooper Library were put into effect. This was done in order to create uniform procedures throughout the library system and to provide better service.

Three publications by members of the Library staff, "Clemson University Periodical and Continuation Titles," by Wilma C. Burkett, Library technical assistant; "South Carolina Agricultural Experiment Station Publications: An Index," by Patricia W. Branham, Library technical assistant and Charles W. Triche, III, reference librarian; and "Indexes and Abstract Journals in the Clemson University Library," by Myra Armistead, documents librarian, were updated as of June 30. These provide quick information about and access to resources of the Library.

## STUDENTS

The 1974-75 academic year began with Clemson University's student body overflowing from dormitory rooms into lounges and study rooms. Bed space also was found in Fike Recreation Center. The Clemson House was converted into dormitory space for 252 women (the capacity increased to 262 for 1975-76). All this was necessary to accommodate 5,592 students living on campus.

A similar situation occurred for fall of 1975 with a greater demand than ever for dormitory space. Some 200 students were living in temporary quarters. The total living on campus reached 5,616.

Total on-campus enrollment for the fall of 1974 was 9,763. As the total neared the 10,000 mark, President Robert Edwards reaffirmed the Board of Trustees' determination that the number should not climb much higher than that. He noted that physical limitations are involved, along with the need to uphold the quality of education and the people-oriented character of the University.

Orientation toward students' needs may be seen in the completion this year of a major addition to Fike Recreation Center and further progress on the University Union complex in the Johnstone Hall quadrangle. Rising from new foundations were Jordan Hall, a biological sciences laboratory building; the Forestry and Recreation Resources Building; Barre Hall for agricultural administration; and an addition to McAdams Hall, an agricultural sciences building. Completion of the addition to Lee Hall for the College of Architecture also took place, along with the beginnings of several renovation projects.

Fike is the first facility ever built specifically for recreational use by Clemson students. It provides for swimming and diving, handball, gymnastics, wrestling, fencing, table tennis and other activities. With the opening of the addition, Clemson men and women for the first time had adequate dressing room facilities for participation in recreational sports.

Clemson's swimming teams also will have proper facilities for intercollegiate meets for the first time, now that the Fike addition is open.

Clemson fielded women's teams in intercollegiate, club-level tennis, swimming and fencing during the year, indicating the University's moral and legal acceptance of Title IX of the Education Amendments of 1972.

In another field involving federal law, Clemson experienced no difficulty in complying with the Buckley Amendment, which allows students to see their college files.



The caliber of the student body is shown, in part, by extracurricular accomplishments.

In the spring, the student government executive staff compiled a "Teacher/Course Evaluation Booklet" for the first time. The ratings were based on questionnaires completed by 67 per cent of the student body.

The lineup of lecturers brought to the campus by the University Speakers Bureau included Shirley Chisholm, a U. S. representative and former presidential candidate; Arthur Goldberg, former secretary of labor, Supreme Court justice and ambassador to the United Nations; Frank Gifford, a sports commentator and former football star; and Irving R. Levine, NBC economics reporter.

The Clemson Players presented *A Funny Thing Happened on the Way to the Forum*, *By the Skin of Our Teeth*, and Ionesco's *The Bald Soprano* and *The Lesson*.

First places and first times play prominent roles in the story of the year.

The campus newspaper, "The Tiger," again won All-American honors. It also was named the best college nondaily in the Southeast in the 11th annual Southeastern College Newspaper Competition.

A three-man team from Clemson won first place in the 1975 National Contest in Public Discussion.

The first graduate in Clemson's Cooperative Education Program earned his degree in 1975, as did Electrical Engineering's first women graduates, three of them. The first woman to earn a Clemson Forestry degree also graduated in 1975.

Educational specialist certificates were awarded to the first persons to complete this new program, which requires 30 hours of study beyond the masters degree.

Academic excellence also continued to characterize the Clemson student body. More than 89 per cent of the entering freshmen in 1974 graduated in the upper half of their high school class. More than 28 per cent were in the top 10 per cent. More than 2,200 students were recognized at the annual Honors and Awards Day ceremonies in April.

Total enrollment was up 4.7 per cent in the 1974 fall semester when a record 10,586 students registered for classes. The on-campus enrollment of 9,763 in 1974 represented a 3.2 per cent increase over the previous year, while graduate enrollment (2,415) was up 9.8 per cent.

Fall 1975 enrollment figures were not available as this report was written, but the on-campus total was expected to be roughly 10,000. In round figures, 5,000 new freshman and transfer students applied for fall 1975, 3,500 were accepted and about 2,400 were expected to attend. A freshman class of 1,950—almost the same as 1974's—was anticipated.

The University awarded 2,272 degrees during academic year 1974-75.

Fall semester enrollment comparisons for recent years are shown below:

<i>Year</i>	<i>Undergraduate</i>	<i>Graduate and Others</i>	<i>Total</i>
1968-69	6,165	674	6,839
1969-70	6,203	818	7,021
1970-71	6,679	1,359	8,038
1971-72	7,300	1,590	8,890
1972-73	7,686	2,071	9,757
1973-74	7,910	2,202	10,112
1974-75	8,171	2,415	10,586

The 1974-75 figures include 691 students attending off-campus institutes and 132 in the Clemson-Furman University Master of Business Administration degree program.

Clemson students come from all 46 South Carolina counties, 48 states, Puerto Rico and the District of Columbia, and 38 foreign countries (140 students). The Admissions Office processed 4,858 applications and more than 12,000 College Board scores for 1974-75. Out of 3,581 students accepted for admission, 65 per cent actually enrolled.

Enrollment of women reached an all-time high during the 1974 fall semester with 3,876, of which 2,771 were undergraduates on the campus. Enrollment of undergraduate coeds increased about 7 per cent over last year. Women students now constitute 35 per cent of on-campus enrollment and about 37 per cent of total enrollment, reflecting a rapid growth trend which is now stabilizing. For 1974 there was a slight decrease in new student men (freshmen and transfers) and an increase in new student women (freshmen and transfers) compared to 1973.

The Clemson University student body continues to be a working group of men and women who also receive significant loan, scholarship and other financial assistance. In 1974-75 approximately



2,600 students earned an estimated \$2,500,000—a figure which does not include substantial earnings from off-campus employment or the College Work-Study Program. Clemson awarded 250 long-term loans. The University also approved and certified 300 guaranteed student loans from a variety of lending institutions. Exclusive of athletic grants-in-aid and donor-selected scholarships, 393 scholarships and grants, valued at \$236,619, were awarded. In all, approximately one-third of the student body received financial assistance administered by Clemson. It is estimated that 60 per cent of the student body received financial assistance from scholarships, grants, athletic grants-in-aid, loans, on-campus student employment, veterans aid, Social Security and rehabilitation benefits totaling about \$6 million during 1974-75.

Additional tabular information about the Clemson University student body is given below:

### Fall Semester 1974 Enrollment by Colleges, and Degrees Awarded Dec. 1973 - Aug. 1974

	Main Campus Enrollment Fall Semester	Degrees Awarded				
		Associate	Bachelor's	Master's	Doctorates	Total
Agricultural Sciences . . . . .	730	0	83	32	11	126
Architecture . . . . .	585	0	66	26	0	92
Education . . . . .	1,875	0	299	373	0	672
Engineering . . . . .	1,319	0	186	62	10	258
Forest & Rec. Resources . .	765	0	97	10	0	107
Ind. Mgt., & Tex. Science . .	1,414	0	242	16	4	262
Liberal Arts . . . . .	1,150	0	180	12	0	192
Nursing . . . . .	447	33	25	0	0	58
Phys. Math & Bio. Sc. . . . .	1,431	0	204	53	19	276
Non-degree . . . . .	49	—	—	—	—	—
<b>TOTALS . . . . .</b>	<b>9,763</b>	<b>33</b>	<b>1,382</b>	<b>584</b>	<b>44</b>	<b>2,043</b>

Degrees awarded since 1896 total 30,091, of which 163 have been associate degrees; 26,234 bachelor's degrees; 3,348 master's degrees; and 346 doctorates.

### Number and Per Cent of Students from South Carolina and from Out-of-State (On-Campus)

Year	S. C.	Per Cent	Out-of-State	Per Cent	Total
1950	2,416	78	677	22	3,093
1960	3,231	80	817	20	4,048
1965	3,494	70	1,530	30	5,024
1966	3,867	70	1,673	30	5,540
1967	4,201	69	1,856	31	6,057
1968	4,604	71	1,921	29	6,525
1969	4,799	72	1,867	28	6,666
1970	5,219	73	1,969	27	7,188
1971	5,968	75	1,997	25	7,965
1972	7,170	83	1,414	17	8,584
1973	7,469	79	1,992	21	9,461
1974	7,704	79	2,059	21	9,763

# NUMBER AND PER CENT OF BLACK STUDENTS

Year	Number	Per Cent
1972	179	2
1973	211	2
1974	216	2

# STUDENT-FACULTY RATIO

(Full-Time Equivalent)

Year	Ratio
1969	12.6 : 1
1970	13.1 : 1
1971	14.6 : 1
1972	14.6 : 1
1973	16.8 : 1
1974	17.9 : 1

# AVERAGE COLLEGE BOARD SCORE OF FRESHMEN

Year	Score
1960	998
1965	1003
1966	995
1967	1005
1968	1005
1969	1015
1970	1005
1971	997
1972	995
1973	982
1974	984

# NUMBER OF TEACHERS

(Full-Time Equivalent Teaching Faculty)

Year	Teachers
1970	571.2
1971	580.1
1972	614.8
1973	578.4
1974	591.8



## NUMBER IN FRESHMAN CLASS

(New Students)

<i>Year</i>	<i>Number</i>
1950	640
1960	1,363
1965	1,479
1966	1,388
1967	1,559
1968	1,632
1969	1,468
1970	1,774
1971	1,853
1972	1,919
1973	2,034
1974	1,949

## ACCEPTANCE RATE OF APPLICANTS

<i>Year</i>	<i>Rate</i>
1967	79%
1968	79
1969	79
1970	87
1971	87
1972	83
1973	83
1974	84

## RETENTION RATE OF STUDENTS

(Freshman Class)

<i>Year</i>	<i>Score</i>
1965	77%
1966	79
1967	76
1968	80
1969	82
1970	78
1971	84
1972	82
1974	83

# NUMBER OF ON-CAMPUS STUDENTS IN SUMMER SCHOOL

<i>Year</i>	<i>Number</i>
1950	948
1960	1,015
1965	3,216
1966	3,539
1967	3,980
1968	4,820
1969	4,472
1970	4,428
1971	4,692
1972	5,232
1973	6,267
1974	5,997
1975	6,886

## NUMBER OF DORM BEDS AND PER CENT BEING UTILIZED

<i>Year</i>	<i>Beds</i>	<i>Per Cent Utilization</i>
1960	2,900	100
1965	3,624	97
1966	3,920	99
1967	4,348	97
1968	4,780	95
1969	4,764	94
1970	5,190	93
1971	5,174	97
1972	5,174	100
1973	5,330	102
1974	5,592*	101
1975	5,616**	103

\* Includes 252 beds in the Clemson House.

\*\* Includes 262 beds in the Clemson House.

## CURRENT OPERATING FUNDS

### Revenues by Source

Student Fees .....	\$ 3,767,390	5.82%
State Appropriations:		
Educational & General .....	24,659,881	38.09%
Agricultural Research & Public Service Activities .....	12,056,120	18.62%
Basic Auxiliary Enterprises (Pay Base Increase—Classified Positions) .....	96,154	.15%
Federal Appropriations:		
Educational & General (Morrill-Nelson) .....	108,801	.17%
Agricultural Research & Public Service Activities .....	6,507,049	10.05%
Gifts and Private Grants .....	475,385	.73%
Research Grants & Contracts, Institutes and Training Grants .....	4,040,626	6.24%
Sale of Farm and Forest Products .....	905,616	1.40%
Other Sales, Services and Miscellaneous Revenues .....	1,855,177	2.87%
Endowment Income .....	34,278	.05%
Auxiliary Enterprises and Related Activities .....	9,998,075	15.44%
<b>TOTAL REVENUES</b> .....	<b>\$64,504,552</b>	
Transfers from Other Fund Groups .....	242,304	.37%
<b>TOTAL REVENUES AND TRANSFERS</b> .....	<b>\$64,746,856</b>	<b>100.00%</b>
Brought forward from 1973-74 for:		
Encumbrances and Restricted Fund Balance .....	4,522,646	
<b>TOTAL FUNDS AVAILABLE</b> .....	<b>\$69,269,502</b>	

### Expenditures by Function

Instruction and Departmental Research .....	\$14,786,080	22.79%
Organized Activities Related to Educational Departments .....	85,913	.13%
Sponsored Research .....	1,666,427	2.57%
Other Separately Budgeted Research (excluding Agricultural Experiment Station and Forestry Research) .....	1,647,129	2.54%
Other Sponsored Programs .....	1,069,488	1.65%
Libraries .....	1,435,001	2.21%
Student Services .....	2,035,537	3.14%
Physical Plant Operation and Maintenance .....	5,668,915	8.74%
Administration and General Expense .....	4,855,666	7.48%
Agricultural and Forestry Research .....	9,055,426	13.95%
Agricultural Extension Service .....	9,863,292	15.20%
Livestock-Poultry Health Service .....	1,756,461	2.71%
Fertilizer Inspection and Analysis .....	113,212	.17%
Plant Pests Regulatory and Disease Eradication Programs and Seed Certification .....	650,344	1.00%
Other Public Service Activities .....	901,553	1.39%
Auxiliary Enterprises and Related Activities .....	9,299,722	14.33%
<b>TOTAL EXPENDITURES</b> .....	<b>\$64,890,166</b>	<b>100.00%</b>
Encumbrances and Restricted Funds Balance .....	\$ 4,379,336	
<b>TOTAL EXPENDITURES AND BALANCE</b> .....	<b>\$69,269,502</b>	

### Student Aid Funds

<b>RECEIPTS AND TRANSFERS</b>		
Loans and Interest Payments .....	\$ 55,630	4.07%
Gifts/Grants for Scholarships, Grants, Fellowships, Other Stipends .....	1,220,501	89.33%
Investment Income .....	67,673	4.95%
Transfers from Other Fund Groups .....	22,486	1.65%
<b>TOTAL</b> .....	<b>\$ 1,366,290</b>	<b>100.00%</b>
<b>DISBURSEMENTS</b>		
Educational Loans .....	\$ 166,215	17.31%
Grants for Scholarships, Fellowships and Special Purposes Stipends (Including Grants-In-Aid) .....	793,813	82.69%
<b>TOTAL</b> .....	<b>\$ 960,028</b>	<b>100.00%</b>

NOTE: Does not include student financing through United Student Aid Funds, Inc., commercial educational lending agencies or scholarship/grants not administered by the University. Funds received and disbursed for graduate assistantships are reflected in Current Operating Funds.



## **PUBLIC SERVICE PROGRAMS OF THE COLLEGE OF AGRICULTURAL SCIENCES**

**L. P. Anderson, Dean**

The College of Agricultural Sciences administers State-wide public service programs in addition to its program for Resident Instruction. Among its public service functions are administration and coordination of the varied activities and services of the South Carolina Agricultural Experiment Station, the Cooperative Extension Service, the Division of Regulatory and Public Service Programs, and the Livestock-Poultry Health Department. Reports for these divisions follow.

### **SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION**

**W. Cecil Godley, Director**

The South Carolina Agricultural Experiment Station is the research and development division of Clemson University's College of Agricultural Sciences. As such, it is to a large degree entrusted with the State's agricultural future.

Created in 1889 by the State under Federal laws (Morrill Act of 1862, Hatch Act of 1887 and subsequent acts), the Experiment Station conducts basic and applied research in agriculture and related sciences. Its findings are used for the improvement and increased well-being of South Carolinians in all strata of society.

The Station operates under State control with annual State appropriations supplemented by Federal appropriations.

Station research programs place emphasis on an interdisciplinary approach to problems in agriculture. Researchers work with other State and federal agencies in problem-solving and information dissemination. Eleven departments are involved in work at the main Simpson Station at Clemson, five branch stations over the State and at Winthrop College.

The Simpson Station at Clemson, the Sandhill Station near Columbia, the Pee Dee Station at Florence, the Edisto Station at Blackville, the Truck Station at Charleston and the Coast Station at Summerville join forces to conduct research that is meaningful to the State as a whole and to their specific areas in particular. Home Economics research is conducted at Winthrop College.

## Highlights and Accomplishments

The following short summary of research under way at the South Carolina Agricultural Experiment Station is meant simply to highlight the extensive program for the period of July 1, 1974, to June 30, 1975.

*Agricultural Economics and Rural Sociology:* Experiment Station economists and sociologists encourage, through their research, a better understanding and use of the rich resources, both human and natural, available to South Carolinians.

In addition to its extensive ongoing research in the areas of marketing, production and management, members of the Experiment Station staff have participated in a regional study of the attitudes, aspirations and expectations of South Carolina high school students at two selected time periods, 1966-67 and 1972-73.

As an outgrowth of this project, two other research studies were initiated. One is an evaluation of a youth project being conducted by the 1890 Extension Program in the State. The second is a study undertaken to determine the factors associated with career choices of beginning college students in Agricultural and Home Economics curricula in 1975.

Learning what consumers look for in pork was the thrust of a preference experiment conducted by the Department this year. Getting 900 consumer opinions on three packages of meat, each containing three samples of a cut of pork, researchers found that 76 per cent of the consumers preferred pork chops with lightest marbling, 57 per cent preferred leanest bacon, but nearly 35 per cent preferred most heavily marbled ham. The research will be useful to swine producers.

Management problems under study are associated with mechanized systems of handling tobacco, cotton, tomatoes and hay. Marketing of milk, vegetables, tobacco, pork and grain is also being analyzed.

*Agricultural Engineering:* Machinery development for food and fiber production and processing, utilization of animal waste, aquacultural mechanization, conservation and use of soil and water resources and dynamic modeling of important crops in the State have had the attention of Agricultural Engineers throughout the year.

Tobacco, the State's top money crop in 1974, will be harvested in part in the future by Clemson's once-over harvester for low-



profile tobacco. Considered of major importance to both small and large growers, the harvester was licensed and manufactured this year by a large equipment company.

The State's declining oyster industry may receive a boost when work is completed on a mechanized oyster harvester under way at Clemson. Simultaneously, work toward complete mechanization of peaches has advanced this year with the redesign of Clemson's over-the-row harvester. Chief improvements include a new drive system, fruit handling system and trunk shaker.

Researchers are looking for better ways to handle herbicides, both for economy and the environment. An injector planter has been developed and patented by the Department. It is being evaluated along with conventional equipment and a new method of using rolling cultivators for incorporation of herbicides.

Experiments involving waste treatment have centered on utilization. An example is the 1,000-gallon anaerobic digester that has been constructed and is currently in operation on the swine research farm. Station scientists are collecting information to determine optimum loading rate and detention time for methane conversion. Plant nutrients remaining in the digester effluent are available for crop production.

*Agronomy and Soils:* Agronomists continue to work toward improving crop production through increased yields and better quality products.

New chemicals to control weeds are being examined for effectiveness and for environmental implications. Experimental and existing herbicides are being evaluated on different soils throughout the State using varying application techniques, herbicide combinations and timing of treatments.

Agronomists are developing and testing new varieties of tobacco, soybeans, corn, small grain, cotton, forage grasses and legumes as a means of increasing sources for resisting disease and insect pests.

Skyrocketing fertilizer costs are encouraging researchers to double their efforts in this area. They have found that many South Carolina soils accumulate potassium and other nutrients in the subsoil that may be used by crops. The study of subsoiling possibilities for fertilization is under way.

Shortening the time span between planting and harvesting cotton, along with a development of a finger-type stripper for harvesting, are the main objectives of a cooperative research project



with agricultural engineers. Row spacings, varieties and nitrogen rates are being evaluated for their effect on plant maturity and harvester performance.

*Animal Science:* Animal scientists are making significant contributions toward improving efficient production of beef and pork with particular concentration on the reduction of feeding costs for the grower.

Maximum utilization of forages, experimental combinations of feeds and evaluations of different grazing systems for cow-calf operations have been among projects stressed this year. Two years of research on silage and drylot cattle feeding systems with limited grain has been concluded.

The use of South Carolina grown barley has been of particular interest to researchers who have combined it with cooked soybeans and found it effective in weight gain tests of 192 growing-finishing pigs.

Researchers continue to emphasize reproductive ability as a means of reducing costs for both grower and consumer. Females are being bred to calve at two years. Also, more efficient use of the sow can be made by early weaning of piglets (about three weeks), the researchers have found.

An insulated, controlled-environment building is nearing completion for swine research and is expected to give a long-awaited boost to projects in this area.

*Dairy Science:* The scope of the concerns of the dairy scientist extends from the moment of calving to the time a consumer selects a dairy product from the supermarket shelf.

The search is continuing for solutions to the cause of early embryonic death in cattle which contributes to extended calving intervals. Researchers have made progress in this direction through extensive studies of the bovine reproductive tract.

Wide fluctuations in feed costs are stimulating studies to increase the ratio of milk output per unit of feed intake. Station researchers have found that labor reduction in the feeding of dairy cows can be accomplished by blending a computerized least-cost concentrate mix with green-chop forage at ensiling. The complete silage can be formulated to provide all the nutrients a dairy cow requires to support relatively high levels of production.

Interest in ecological balances has led to studies to determine the effects of dairy farm runoff on nearby streams. Bacterial counts

made from "virgin" streams showed that fecal coliform levels were significantly higher than State standard specifications for class A water of two per millimeter, indicating that pollution is present prior to infiltration from dairy farms.

Certain bacteria capable of growing at refrigerated temperatures reduce the shelf life of processed milk. Clemson researchers observed a high correlation between oxidase positive bacterial counts and flavor scores in milk. An equation for predicting shelf-life has resulted and is being further tested.

*Entomology and Economic Zoology:* Development of strategies for insect control is directed toward maximum usage of natural control agents with minimum selected chemicals used on a prescribed basis.

Pest insects such as the face fly, which creates conditions that lead to eye diseases such as pink eye in cattle, are under study by entomologists. Experiments that seek to determine if mineral supplements containing certain chemicals will prevent the larvae from developing in cattle droppings show promise.

Pest management also focused on control of house flies on local poultry farms with the use of a new insect growth regulator (Dimilin) and periodic releases of commercially available house fly parasites. These methods reduced numbers of flies to acceptable levels.

A pilot program for pest management based on research done in South Carolina was initiated in commercial soybean fields in Brazil. The testing in Brazil helped speed the process of implementation due to the opposite seasons in the two locations. Findings indicate that a soybean pest management program for South Carolina is feasible, and testing in the State is now underway.

Research projects in the area of wildlife have centered on determining the useful and detrimental effects of a rapidly increasing beaver population in the State and the effects of thermal effluent on natural aquatic organisms. The latter is being conducted on Lake Keowee, site of the Oconee Nuclear Station.

*Food Science:* Research in human nutrition is providing important information about methods of appetite control, effects of oral contraceptives on vitamin and mineral needs, aging and the role of hydrogenated fats in cholesterol metabolism.

Experiment Station food scientists are attempting to examine the role of Vitamin E in preventing degenerative processes associated with growing older.



Studies under way are designed to provide a better understanding of the role certain components of dietary fat play in regard to cholesterol metabolism and subsequent plasma cholesterol elevation. The still controversial cause-and-effect relationship is being scrutinized with particular emphasis on hydrogenated fat.

Controlling appetite through use of pectin is being investigated. Pectin, a naturally-occurring substance, has been shown capable of absorbing 30 to 40 times its weight in water when incorporated into food products. Taste-tested by panels, pectin consumed in foods at appropriate intervals prior to mealtimes has acted as an appetite suppressant. Studies are continuing to determine effectiveness and acceptance of the final food products.

Concern about the possible effect of oral contraceptives on nutrition has prompted research which indicates that hemoglobin, hematocrit, serum iron and iron binding capacity are higher in contraceptive users. Serum vitamin B-12 levels are lower. Folic acid data is inconclusive. The study will continue.

*Home Economics:* Research at Winthrop College, where home economics-related experiments are conducted for the Station, has centered on youth this year.

An extensive study on the patterns of food intake and nutritional health of young girls nine through 12 years of age involved clinical tests and collection of data. A thesis is being prepared on the relationship between food likes and dislikes of the children in the study and those of their parents.

A program designed to document the status of rural child care programs in the Carolinas should assist individuals or agencies in providing child care delivery systems and provide accurate indications of child care needs.

Influences on occupational goals of young people have been studied in a follow-up to an earlier project. The program will provide greater understanding of goal formation by youth.

Studies continue on consumer acceptance of flame-retardant children's sleepwear and a comparison of consumer and laboratory evaluation of carpets. Both projects will benefit textile manufacturers and consumers.

*Horticulture:* Clemson's horticultural research helps make life more enjoyable while raising the standards of living for individual South Carolinians.



The broad-based horticultural program includes fruits, vegetables, ornamentals, floriculture, turf and postharvest handling. Each field inspires innovative and relevant research projects that improve the final product that reaches the South Carolina consumer.

For the past five years horticulturists have evaluated effects of new harvesting and handling methods on the quality and storage life of commercially important horticultural crops, especially peaches and tomatoes. The objective is to determine the feasibility of machine harvesting fruit that currently is being hand harvested for the fresh market. Experiments to date indicate that machine harvesting for this purpose is feasible, although concepts of growing and handling and storage must be changed.

Clemson scientists are seeking to improve quality of life through reducing need for pesticides, making more efficient use of water and fertilizers, reducing waste from food processing methods, recycling solid waste, reducing air pollution and improving the aesthetic value of our surroundings.

Developing new vegetable crops for South Carolina has pointed to a need for precision seeding systems. Applied research in this area shows definite promise for a "plug-mix" system of planting many small seeded vegetables.

Local processors are helping evaluate the possibilities of a completely mechanized approach to producing processing tomatoes. Problems remain but both processors and horticulturists think the plan has merit.

*Plant Pathology and Physiology:* South Carolinians, from the large grower to the backyard gardener, benefit from solutions to plant diseases found by plant pathologists in their research at the Experiment Station.

Among the projects in progress is an attempt to find means to combat several viruses that are deteriorating white clover stands in the Southeast. The most logical solution to the problem is believed to be the development of cultivars resistant to the prevalent viruses. The viruses have been isolated, identified and the genetic sources of resistance found, and now pathologists are attempting to transfer this resistance from its source into acceptable lines of white clover.

Two-pronged research is aimed at fomes root and butt rot of pine and other conifers. This destructive disease is being attacked by such methods as stump treatment during the thinning operations or by cutting at specific periods of the year. A second attack

is directed toward understanding what conditions are favorable for infection and trying to alter them.

A 10-point program designed for alleviation of peach short life problems has again appeared in 1975 to be effective in ongoing experiments.

Columbia lance nematodes is a target of plant pathologists because of the large number of crops affected by this pest. Other matters that interest Clemson researchers include replacements for the mercury seed treatments outlawed from the market and the control of fungus diseases in ornamental plants.

*Poultry Science:* Broader-based research by poultry scientists will benefit avian hobbyists and consumers as well as commercial poultrymen.

Nutrition and management research indicates that hobby birds such as bantams, keets, quail and squab may prove efficient sources of animal protein. Squab and quail, now considered delicacies, are being studied for possible commercial production.

The current shortage of planer shavings for use as poultry litter led to studies of soft and hard wood barks as substitutes. Use of this timber industry by-product could save State poultrymen over a million dollars annually.

Environmental factors such as ambient temperature and length of light day have been investigated for their effect on growth, feed efficiency, egg production and semen production.

Studies of chick embryos grown in transparent containers may assist research on drugs, nutrients and infectious diseases, using an accessible and easily observed embryo.

Research has demonstrated that poultry manure can be ensiled with conversion to a palatable, nutritious cattle feed. The project will benefit South Carolina cattlemen and poultrymen.

Other studies have included proper cooking times for optimum quality in eggs and investigations of rabbit coccidiosis.

# **Funds for the Experiment Station Other Than Those from Federal Sources**

## **Classification of Expenditures and Receipts for 1974-75**

	<i>Agricultural Research</i>	<i>Operating Revenue</i>
Personal Services .....	\$3,551,655	\$ 160,642
Freight, Express and Deliveries .....	1,059	700
Travel .....	73,115	19,578
Communications Services .....	54,637	6,369
Contracted Services .....	44,216	103,625
Utility Services .....	57,926	18,912
Other Contracted Services .....	248,009	142,923
Supplies .....	447,061	325,723
Rents and Fixed Charges .....	64,000	62,959
Equipment .....	306,806	192,547
Land and Structures .....	63,507	84,686
	<hr/>	<hr/>
Expenditures .....	\$4,911,991	\$1,118,664
Receipts from State Treasurer (Regular Appropriation) .....	4,863,058	
Operating Revenue Receipts .....		893,476
Unexpended Balance Brought Forward from Previous Year .....	48,933	678,931
	<hr/>	<hr/>
Balance Forward .....	-0-	\$ 453,743



# **Federal Funds** **The South Carolina Agricultural Experiment Station—1974-75**

	<i>Hatch</i>	<i>Regional Research Funds</i>
Personal Services .....	\$ 940,112	\$ 185,253
Freight .....	303	
Travel .....	31,156	6,621
Communications Services .....	11,919	2,369
Contracted Services .....	6,619	
Utility Services .....	19,988	187
Other Contractual Services .....	27,355	22,448
Supplies and Materials .....	197,394	52,028
Rents and Fixed Charges .....	20,046	3,066
Equipment .....	61,064	10,156
	<hr/>	<hr/>
Expenditures .....	\$1,315,956	\$ 282,128
Receipts for the Year from the Treasurer of the United States .....	\$1,315,956	\$ 282,128

## **Active Research Projects, 1974-75**

### *Agricultural Economics and Rural Sociology*

A farm-oriented economic appraisal of potential technological and institutional changes in South Carolina agriculture

Market and production potential for South Carolina ornamental crops

Systems analysis of the vegetable subsector of the food industry of the South

Contract marketing of cotton

An economic analysis of adjustments in rural human resources as new technology is adapted

The economic and social effects of farm resource transfers out of the dairy industry in South Carolina

Economic analysis of the opportunities to develop rural tidelands industries through improved financial management

Consumer preference for pork cuts with varying degrees of marbling

Economic analysis of harvesting, handling and storing hay

An extension community resource development process: analysis and evaluation

Feed mill costs and returns in South Carolina

Implications of alternative federal energy policies on South Carolina economy, with emphasis on agriculture

Consumer preference for beef cuts with varying degrees of marbling

Local factors affecting industrial plant location in rural communities of the South Carolina Coastal Plains

Marketing performance of selected milk pricing systems for the Southern Region

Career orientations of college students majoring in agriculture and home economics curricula in South Carolina

Economic appraisal of farming adjustment opportunities

Develop and operate an Information Filter Center to aid in marketing

Evaluation of the beef production industry in the South

Providing basic agricultural marketing information for program and facility planning

Economic evaluation of market organization and policy in the South Carolina dairy industry

Market organization, power, policies and programs in the dairy industry

Economic evaluation of alternative forms of vertical coordination in the livestock-meat industry

Predicted effects of selected policy and technology changes in the grain marketing system

Social impact of economic and population change in transitional South Carolina counties

Analysis of demographic data for the human resources of South Carolina

Development of human resource potential of rural youth in the South and their patterns of mobility

Effects of selected changes in the real property tax system on agricultural land use and tax revenues in South Carolina

Economic and sociological aspects of comprehensive land-use planning in South Carolina

## *Agricultural Engineering*

Soil water management decision making  
Methods and equipment for optimum herbicide placement  
Crop mechanization  
Animal waste treatment and recycling systems  
Root zone water management systems  
Physical properties of fruits and vegetables relating to automatic sorting  
Farm and gin community evaluations of machinery complements for harvesting and hauling seed cotton  
Quality losses during storage of baled Coastal bermudagrass hay  
Rate of seed moisture uptake as affected by soil moisture availability and seed soil contact  
Engineering systems for cotton production  
Quality housing environment for low income families  
Poultry farm waste management  
Development and evaluation of mechanized production systems for fresh market peaches  
Simulation of processes in the Rhizosphere  
Development and evaluation of oyster harvesting equipment and mariculture systems  
Nutrient management of poultry waste with biological treatment processes  
Decision making in crop water management  
Mechanization of tobacco harvesting and curing systems  
Utilization of cattle feed lot waste through land application  
Soil and environmental factors affecting longevity and productivity of peach trees  
Hydrology of Piedmont agricultural watersheds  
Feasibility of mechanizing the production of vegetables for fresh market and processing  
Factors affecting water yields from shallow ground aquifers  
Mechanical okra harvesting  
Dairy farm waste-management characterization and disposal  
Dynamic modeling of weed control in cotton production



## *Agronomy and Soils*

- Short season cotton production as affected by variety, row spacing, nitrogen rate and harvest method
- Orchardgrass improvement
- Adaptation of perennial forage grass species
- Sulfur supply of air, rainwater and soil as related to agronomic and horticultural crop needs
- Interaction of representative pesticides in Cecil and Norfolk soils
- Adaption and breeding of a cool-season forage grass species
- Plant analysis for complementing soil tests in evaluation of nutrient availability
- Weed control in permanent pastures and other forage crops in South Carolina
- Interaction of representative pesticides with dominant South Carolina soils and model soils
- Soil biological factors affecting nitrogen fixation by leguminous and nonleguminous associations
- Hybrid corn breeding
- Selection for heat-drought tolerance in agronomic crops and treatments to induce tolerances in white clover
- Soil-water and plant water relations in soybeans as related to root growth
- Soil biophysical factors affecting soybean root growth, nitrogen fixation and yields
- Breeding fiber quality in cotton
- Tobacco disease control
- Pedological studies in South Carolina
- Variables influencing sward of clover-grass pastures
- Surfactant's influence on herbicide effectiveness
- Cotton breeding
- Small grain breeding
- Soybean breeding
- Moisture nutrient availability and subsoil compaction
- Permanent pastures, with and without interseeded species, for beef cow-calf production
- Evaluation of selected varieties and advanced experimental strains of cotton

Evaluation of corn hybrids and advanced breeding lines  
 Evaluation of selected varieties and advanced experimental strains of soybeans  
 Evaluation of varieties and experimental strains of wheat, oats, barley and rye  
 Cytology of trifolium species in the section *Amoria* (Ascherson and Graebner)  
 Minimum tillage and no tillage in production of corn and soybeans  
 Evaluation of the micronutrient status of soils and plant response to added micronutrients  
 South Carolina soybeans yields as influenced by row spacing  
 Growing cool-season pasture species in association with coastal Bermudagrass  
 Soil behavior under different levels of management and use  
 Herbicide movement for application sites and effects on nontarget species  
 Evaluation of new fertilizers as sources of plant nutrients for South Carolina crops  
 Evaluation of selected grain sorghum hybrids  
 Diagnosis and correction of zinc problems in corn and rice production  
 Development of weed control practices in corn, cotton, and soybeans  
 Fertilizers and organic wastes applied to soils in relation to environmental quality

### *Animal Science*

Protein and energy studies with early weaned pigs  
 Litter size as affected by nutrition and exogenous hormones (swine)  
 Diets for artificially reared pigs  
 Swine arthritis  
 Reproduction problems in livestock  
 Control of estrus and parturition in the bovine using Prostaglandin F<sub>2a</sub>  
 Corn silage, additives and high or low moisture grains in beef cattle systems

Ration alternatives using cooked soybeans for growing-finishing swine  
Genotypic and phenotypic response of crossbred cattle under different levels of management  
Factors influencing nitrogen utilization in the equine  
Comparison of methods of measuring composition in the live animal  
Corn silage, urea and corn for finishing beef cattle in drylot  
Factors responsible for tenderness variations in meat

### *Dairy Science*

Accuracy of milk production estimates by the use of the AM-PM method  
The role of antibiotic therapy in the production of normal milk  
Innovative materials handling for packaging and distributing milk  
Ensiled complete rations for lactating cattle  
Waste disposal management in the dairy industry and its relation to surface water quality  
Feeding value of fermented colostrum for preruminant calves  
The role of energy compounds and hormones in regulating lipid metabolism in ruminants  
Effect of age and quality of raw milk on the shelf-life of the processed fluid product  
Sex steroids and their relationships to fertility in bovine female  
The role of methionine and sulfur in rations containing urea when fed to ruminants  
Flavor quality and milk consumption  
Improving reproduction efficiency in South Carolina dairy herds  
Management factors and decisions that are different between high and low producing dairy herds as related to udder health

### *Entomology and Economic Zoology*

Wildlife management research  
Biology and control of insect pests of legumes and forage crops  
Epidemiological and biological studies of *Leucocytozoon smithi* in turkeys  
Animal waste treatment and recycling systems  
Bionomics and control of the pecan weevil  
Insect pest management



Effect of infection of *Eimeria* spp. upon intestinal absorption of carbohydrates in chicks  
 Development of pathogens for use in a pest management system for soybean insects  
 Biology, ecology, and control of Simuliidae in South Carolina  
 Investigations of leucocytozoonosis in poultry in South Carolina  
 Bionomics and control of insects on cotton  
 Southern pine beetle management  
 Distribution and biology of parasites in domestic animals  
 Insects as hosts and vectors of viruses  
 Biology, ecology and management of peach insects  
 External parasites of poultry, their biology, distribution and control  
 Culture of warm water fishes  
 Studies of the economically important species: *Mercenaria mercenaria* and *Macrobrachium rosenbergii*  
 Boll weevil investigations  
 Tobacco insect investigations  
 Insects on corn and miscellaneous field crops  
 Biology and control of insects affecting forests  
 Bionomics, parasites and predators of the Nantucket Pine Tip Moth  
 Effect of tranquilizing agents on insects  
 Biology and control of insects affecting man and animals  
 Control of arthropods on apples  
*Conutrachelus Nenuphar* (Herbst); ecology, agricultural impact and management  
 Control of vegetable insects in the Piedmont of South Carolina  
 Biology and control of insects attacking ornamental plants  
 Biology and control of arthropods attacking pecans  
 Biology and control of white peach scale and cat-facing insects attacking peach trees  
 Biology and control of peach tree borers  
 Identification and distribution of insects of economic importance in South Carolina  
 Pond culture of warm-water fish  
 Biology and control of blackflies transmitting *Leucocytozoon smithi*  
 Catfish breeding, production and marketing

### *Food Science*

- Salt-free biodegradable solutions for storage of pickling cucumbers
- Growth of and toxin production of *Clostridium perfringens* in food
- Pectin as an appetite depressant
- Oral contraceptives and nutritional status
- Oilseed concentrate and rheological properties in processed meats
- Quality of dried sausages
- Microbial injury and food quality
- Amino acid composition and protein quality of corn
- Effect of ripening and microbial infection on pectic substances of fresh fruit
- Zinc metabolism in poultry
- Utilization of oilseed materials as human food
- Effect of light on postharvest fruit
- Utilization of dietary fat from various sources
- Intestinal parasitism and nutrient absorption in poultry
- Nutritional aberrations and ethanol, and behavior of offspring in rats
- Development of low cholesterol eggs
- Quality of bound poultry and red meat products
- Broiler carcass character and processing quality

### *Home Economics*

- Patterns of food intake and nutritional health of girls
- Investigation of consumer acceptance of flame retardant infant's sleepwear
- Comparison of consumer and laboratory evaluation of carpets
- Needs for child care and potential for rural family and community development
- A model system to determine the role of molecular sizes of carbohydrates on mouth sensations

### *Horticulture*

- Relationship of fruit characteristics and quality to location and environmental factors
- Cultural management of centipede grass
- Cultural and management practices for peaches and small fruits
- Therapeutic, physical, psychological and rehabilitated responses to certain aspects of horticulture

The use of chemical preservatives in extending the vase life of cut snapdragons  
 Detection and evaluation of plant growth-environment relationships  
 Physiological study of plant growth regulators on woody ornamental plants  
 Breeding edible Southern peas  
 Growth regulators in peach production  
 New or special crops  
 Development and evaluation of rootstocks for peach  
 Breeding bunch grapes for the Southeast  
 Influence of environmental factors and chemical growth regulators on growth and development of floricultural crops  
 Evaluation of woody ornamental plant material with respect to variety, production, propagation and marketing techniques  
 Factors affecting the purchase and use of sweet potatoes  
 Cultural studies and functional uses of woody ornamental landscape plants  
 Uses of seaweed and other organic materials in economically important horticultural crops  
 Quality maintenance of mechanically harvested horticultural crops for fresh market  
 Delayed ripening and senescence in peaches and other fruits  
 Vegetable culture  
 Lawn grasses, fruits for the coastal area  
 Evaluation, improvement, horticultural crops and varieties  
 Nutrition, management, horticultural crops and varieties  
 Development of plum varieties for coastal plains  
 Improving cultural and management practices for tree and small fruits  
 Evaluation of fruit varieties and rootstocks  
 Disease resistant cantaloupe varieties  
 Plant growth regulators on physiological changes  
 Effect of seaweed extract and seaweed meal on the quality, shelf-life and yield of peaches  
 Post-harvest treatments, environmental factors on shelf-life, market quality of peaches  
 Processing fruits and vegetables



Flowering plants' relation to variety and production techniques  
Mineral nutrition, management practices, ornamentals and turf  
Development of weed control practices for vegetable crops  
Growth, yield, fruit quality of pears, commercial cultural practices  
Identification and behavior of the pigments which cause discoloration in canned peaches  
Development, production and management of turf-grasses  
Peach breeding  
Sweet potato breeding  
New equipment and techniques to handle, package, transport and store peaches  
Apple production  
Evaluation of vegetable varieties and cultural practices

### *Plant Pathology and Physiology*

Integrated plant disease control and farming systems with field and vegetable crops  
Etiology, epidemiology and control of pecan leaf diseases  
Bacterial canker and other factors associated with peach tree short life  
Hoplolaimus columbus (lance nematode): population management, crop damage and control  
Peach tree short life: a physiological approach  
Ecology and control of fusiform rust on southern pines  
Disease control on vegetables  
Diseases of forest trees  
Seed and seedling diseases of cotton and their control  
Diseases of soybeans  
Diseases of ornamental shrubs and flowers of South Carolina  
Investigation of the mechanism of herbicidal action  
Pesticides for the control of fruit diseases in South Carolina  
Biological determination of performance for planting seed  
White clover pathology, virus and other diseases  
Causes and control of diseases of cereal grains in South Carolina  
Cause and control of diseases of shade and ornamental trees

### *Poultry Science*

Effects of polychlorinated-bi phenyls (PCB) in poultry diets  
Artificial insemination and fertility studies with caged breeder chicks  
Turkey malaria  
Recycling of turkey litter into ruminant diets

Reproduction characteristics and nutritional requirements of minor poultry groups  
 Marketing potential of white leghorn cockerels and other minor poultry groups  
 Rabbit coccidiosis and nutrition  
*In Vitro* cultivation of the chick embryo  
 Improvement of egg shell quality through nutrition and management  
 Immunological response in turkeys vaccinated against fowl cholera  
 Turkey reproduction: physiological, nutritional and environmental interactions  
 Biology and control of poultry *Coccidia* using *In Vitro* methods  
 Effect of noise pollution on the fowl  
 Transmission, pathology and control of Leucocytozoon disease in turkeys  
 Photoperiods for layers  
 Effects of environment on reproduction of chickens and turkeys  
 Leucocytozoon research

*Edisto Experiment Station*  
*Blackville, S. C.*

A comparison of corn and sorghum silage for the production of beef in the Coastal Plains  
 Development and evaluation of insect resistant soybean cultivars  
 Sorghums for silage production  
 Summer grazing crop varieties  
 Factors limiting production of field crops  
 Biology and control of arthropods on soybeans  
 Diseases of cantaloupes and watermelons and their control

*Pee Dee Experiment Station*  
*Florence, S. C.*

Tobacco production research  
 Mechanization of tobacco  
 Tobacco breeding

*Sandhill Experiment Station*  
*Columbia, S. C.*

Cultural and management practices for pecans  
 Peach tree certification

## Experiment Station Publications, 1974-75

### *Bulletins*

- SB 574—"The Consumer and Flame-Retardant Sleepwear: Consumer Attitudes" by: Kenneth C. Laughlin
- SB 575—"Population Studies with Cotton (*Gossypium Hirsutum* L.)" by: T. W. Culp, D. C. Harrell and J. B. Pitner
- SB 576—"Present and Potential Beef Production in the Lower Piedmont" by: Charles P. Butler
- SB 577—"Inspection and Analysis of Commercial Fertilizers in South Carolina" by: H. V. Rogers
- SB 578—"Trends in Use of Cotton and Competing Fibers, 1973" by: C. D. Rogers, H. C. Spurlock and D. E. Crawford
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- SB 581—"The Consumer and Flame Retardant Sleepwear: II. Consumer and Laboratory Evaluation of Children's Winter Nightgowns Size 0-6X" by: Kenneth C. Laughlin
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- SB 583—"Consumer Preference for Pork Cuts With Varying Degrees of Marbling" by: L. D. Malphrus

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- 376-a "An Economic Analysis of Petroleum Useage in South Carolina Part 1" by: J. C. Hite and David Mulkey
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## COOPERATIVE EXTENSION SERVICE

Wayne T. O'Dell, Director

The Cooperative Extension Service is Clemson University's outreach educational program for the people of South Carolina.

Funded on a joint Federal-State basis, it was established as a part of the nationwide system in the early 1900's in recognition of a need for trained field workers to carry education to the people.

This program enables Clemson University through its Extension Service to maintain an outreach office in each county seat of South Carolina, staffed by County Agent personnel and Extension Home Economists. The nerve center for this "off-campus" faculty is the University. There a professional staff of Extension subject matter specialists compiles information through research results, translating this into usable data for the people of South Carolina.

From the practical standpoint, this means a pipeline of information is continually going out to the individual counties and their residents.

In agriculture, the soybean producer, the cotton farmer, the beef cattleman, the dairy operator—whatever the commodity or product—is being constantly updated on ways to combat problems, increase production or help control expenses.

It's the same for the homemakers and youth. Through the County Extension Home Economists and the Clemson specialist staff, homemakers are counseled on new developments in the food field, invited to sewing classes, organized into groups for weight control, given guidelines for budget-making, and helped on any of a hundred other fronts dealing with modern homemaking and family living.

Extension's unique 4-H program offers the same broad programs for youth development, challenging them to progress along the realistic road of personal achievement through doing.

Extension began as an organization to help rural people, but in fulfilling its commitments—based on needs and demands of the public—it has had to expand to include many problems of urban and suburban areas. This expansion was brought about largely by a changing social structure, the economics of modern living, rapid expansion of communication and transportation systems.

Today, as rural and urban areas of South Carolina merge in a common main street of the State, people everywhere face about the same problems and have similar hopes and aspirations.



The Clemson University Cooperative Extension Service joins with these people in the development of educational programs which the people themselves feel will help them increase their incomes and maintain levels of living in communities where they live. Today's Extension staff members are at home in any classroom, be it tobacco field, dairy barn, homemaker's kitchen or agribusiness office.

The total effort of Extension is organized into six broad program areas in order to intensify assistance and gain greatest utilization of special skills. These areas cover Agricultural programs, 4-H and youth development, home economics, community and resource development, special programs and 1890 programs.

This report of their comprehensive programs provides highlights of only a few of their many activities for the year.

### **Agricultural Programs**

*Scope of Activity:* Agriculture in South Carolina currently is facing intensified pressures perhaps unheralded in its history. With spiraling inflationary input costs eroding profit potential and threatening even basic survival, farmers are fighting a battle on many fronts.

It's a situation that has brought new challenges and increased demands for Clemson's Cooperative Extension Service and its agricultural programs.

Complex, changing conditions in production, harvesting and marketing require accelerated and expanded Extension programs to provide educational information farmers must have for survival.

Nowhere is this more vital than in chemical usage, now a basic and vital fact of life in agricultural production. Extension provides complete and ongoing instructions in this field for all farmers in the State.

It's much the same in all areas of production. Row-crop farmers, livestock producers, fruit growers and other segments must have access to a continued, reliable flow of material and information to cope with rapid changes hitting their operation. Extension works to provide the needed answers for all.

Expertise is concentrated in the disciplines of Economics, Agronomy, Animal Science, Dairy Science, Forestry, Food Science, Horticulture, Poultry Science, Agricultural Engineering and Entomology and Economic Zoology. Wherever necessary, they utilize a team

approach in applying multiple skills for specified problem areas or outlined goals.

These are some of the highlights of their activities for the year:

### *Agricultural Engineering*

Three equipment field days drew more than 1,000 farmers during the year. Two statewide "Hay Days," one in Greenwood County and the other in Darlington, attracted interested cattlemen and equipment dealers from a three-state area.

The newest equipment and systems for haymaking, hay handling and feeding were demonstrated, showing that one man with tractor power can handle many more tons of hay a day than an eight-man labor crew. Participating in the two field days were 33 equipment firms who demonstrated 91 different pieces of equipment.

A successful field day and demonstration of equipment for the directed application of strong or "hot" herbicides was held at the Sumter Agricultural Project in March. More than 250 farmers and equipment people saw the newest types of spray equipment demonstrated. They were instructed in the correct calibration and adjustment of directed spray equipment, and new herbicides now available for control of tough weeds in cotton, corn and soybeans were discussed. The audience was told that these expensive crop inputs, to be profitable, required accurate and timely application of the correct rates of chemical per acre. Many equipment dealers sent their sales and service personnel to receive training. Fifteen firms cooperated and demonstrated 28 pieces of equipment.

In the area of housing and energy conservation, one of the more successful events of the year was the Solar Energy Conference. Agricultural Engineering assisted in the planning and conduct of this inter-departmental conference. More than 750 attended the two-day event, including a number of craftsmen from the heating, air conditioning and plumbing trades. Displays of several solar heating systems and equipment components attracted much interest. Since the conference, Agricultural Engineering has received a number of requests for information on solar energy considerations in residential construction.

As a result of land-forming demonstrations held during 1970-73 in 10 Coastal Plain counties, some 20 growers have during the past year improved more than 1,500 acres. With the rapid increase in size of farm and size of equipment, land forming for improved surface drainage is imperative. Larger fields and longer rows are needed for efficient use of big equipment.



Ten new trickle irrigation systems for staked tomatoes and peaches have gone in during the 74-75 year. This new system conserves water, holds down diseases brought on by wet foliage and operates automatically. Test demonstrations at the Sandhill Experiment Station and at the Sumter Agricultural Project three years ago are beginning to bear fruit.

### *Agronomy and Soils*

In February and March, 14 "Soybean Showdown" meetings were held throughout the State to coordinate presentation of latest practices and recommendations in soybean production for growers. Specialists from Agronomy and Soils, Plant Pathology, Entomology and Agricultural Engineering joined in presenting the information.

Extension forage programs placed special emphasis on growing legumes for reducing nitrogen fertilizer needs and improving forage quality.

Ten special alfalfa demonstrations were planted, and a large number of white clover demonstrations were established by co-operating farmers with the assistance of county agents and commercial interests. Procedures were demonstrated on how to obtain stands of arrowleaf clover on dormant bermudagrass sod and to manage the forage produced so as to fill a "grazing gap" that exists in forage programs in the upper Coastal Plain counties.

A demonstration program designed to examine the feasibility of limited seedbed preparation and twin-drill planting systems was initiated in the spring of 1974. Limited seedbed preparation is a form of minimum tillage which has the possibility of substantially reducing production costs. Twin-drill planting increases the population of plants per acre and has the capability of hastening maturity and reducing weed and insect control costs.

The Extension education program in soil management has assisted the increased number of home owners that are planting vegetable gardens. It also assisted farmers in maintaining production when fertilizer was in short supply.

During the past 12 months, the number of soil samples submitted to the soil testing laboratory increased from 42,000 to 58,000, reflecting a 40 per cent increase in the use of this soil management tool.

### *Animal Science*

The adverse feed situation and "top" hog prices during the middle of 1974 resulted in one of the largest sell-offs of swine breeding stock the State has experienced since records were started.



This sell-off was also occurring nationwide, and as a result, the prices for live hogs recovered in late 1974 and early 1975 with swine producers receiving excellent prices. This in turn caused an upturn in swine production in South Carolina, but not enough to offset the loss in 1974.

To keep producers abreast of the situation and help them with ways of combating spiraling costs of production during the marketing crisis, Extension Animal Science specialists held several regional and county meetings which were well attended.

In-service training was also conducted for agents to give them latest information on management and production factors to help reduce costs.

One new graded feeder pig sale was started in Orangeburg, increasing the number to four now operating in the State.

The reduced price for cattle and increased cost of production in 1974 placed a severe economic squeeze on cattlemen in South Carolina. In response, Extension formed a team approach to present information on the economic situation, outlook, suggestions for production and management of beef cattle, and production and utilization of forages.

Team members included an Animal Scientist, Agronomist and Agricultural Economist. From the fall of 1974 through the spring of 1975, the group met with 17 county or area cattlemen's associations to present the special situational outlook and offer recommendations. A total of 714 cattlemen attended, an average of 42 per meeting.

The performance testing program continues to grow. Last year there were 122 producers entered in the program with 5,981 calves weighed and graded. These producers were located in 28 counties.

The 14th All Breed Bull Sale was held in Orangeburg with 98 bulls selling. This sale continues to be a place that commercial breeders look for their herd bulls.

Interest and participation in horse events continues to increase, particularly within the 4-H horse program. South Carolina had its first national 4-H horse winner in 1974 when Adele McLaughlin of Kershaw County finished among the elite top group. Also, a new participation record was set at the '75 State 4-H Horse Show with more than 400 entries. This may have been the largest youth livestock event ever in South Carolina.

## *Dairy Science*

One of the highlights of the year for Extension Dairy Science was a dairy production conference held at Clemson and attended by 186 producers, County Extension personnel and others of the industry.

In the face of an increasing bind for dairymen, a panel of outstanding speakers presented subject matter on dairy cattle nutrition, reproductive physiology, labor management and herd health.

Another outstanding activity was the dairy heifer project initiated in July 1973 with the support of South Carolina state breed club members. It was designed for girls and boys not living on dairy farms nor having facilities for milking cows, but who still wanted the experience of raising and showing dairy heifers.

Objectives included: getting girls and boys not living on dairy farms involved with raising and showing dairy heifers; providing more first-hand information on the South Carolina dairy industry; and offering the opportunity for business management training by letting the youngsters borrow money for their animals and repaying the obligations out of sale proceeds.

The first dairy heifer project sale was held December 7, 1974, at the fairgrounds in Columbia. The average price was \$650 per animal, and at this price the youngsters about broke even, but they did gain valuable experience.

Generally, the project was considered a success for the inaugural year.

Dairy Science Extension also continued during the year its outreach programs of assisting producers, through county agent activities, with individual problems and special help.

## *Entomology and Economic Zoology*

Improved fly control around animal operations has been a highly significant accomplishment in Extension Entomology, as Entomologists have tested new ULV (Ultra Low Volume) and Automatic Aerosol devices with outstanding results.

This improvement in technology has reduced for producers the number and severity of fly problems with the health departments and citizen complaints.

Significant advances also are being made in soybean insect pest management. Growers participating in the Clarendon County soybean scouting demonstration have accepted the project well, and there are hopes the program can be adapted to other areas of the



State. Several insect outbreaks have been detected and controls applied before loss of yield.

The fruit industry in South Carolina has been helped tremendously by the use of a chemical for control of the peach tree borer with the potential to greatly reduce the problem with grape root borers.

Previously-used materials were in some cases producing little or no effect on peach tree borers. The development of LORSBAN has increased borer control in peaches and shows excellent control on grape root borer. If this pest can be chemically controlled, it could result in rapid growth of the grape industry in the State.

It is also noted that aerial application on peaches and pecans will assist growers in application of sprays, particularly during inclement weather. A three-year study has shown that aerial application is as good as, and in some cases better than, ground application. One major factor observed is a lesser amount of mechanical injury due to driving of sprayers through orchards.

Aerial application in pecans started this year, and to date, trees being tested show excellent crops and good insect control.

### *Food Science*

Several new food processing operations were started in South Carolina during the year, with Extension Food Science providing assistance in developing optimum product flow design and equipment layout representing approximately \$750 million in new capital investment.

Included in product lines developed were potato snacks, fresh and frozen shucked oysters, and fresh peeled and custom cut potato products. Information was also provided in answer to several inquiries regarding initiating custom cutting locker meat plants.

Program assistance was continued for existing food processors including in-plant heat penetration determinations to assure process adequacy for prevention of spoilage or other potential health hazards. A 19-page model on product recall program for food processors was prepared and distributed, and a 30-page instructional sanitation manual was written and printed for conducting on-site food handler workshops to teach techniques used in prevention of food borne illness.

Help was also given on designing, improving or implementing quality control programs for fruit-vegetable canners, a seafood canner, two potato processors and a baker.



The resurgence in home gardening brought renewed interest in community canneries, and some areas faced a decision in renovating or building these facilities. Extension Food Science developed working plans, equipment layout recommendations and waste discharge guidelines for construction of these canneries in four areas of the State. Help for homemakers was also given in food preservation through publications and demonstrations, and leadership was provided in developing and staging a public seminar on nutritional labeling.

### *Forestry*

The South Carolina State Commission of Forestry and Clemson Extension Forestry worked cooperatively in the collection of field data from primary wood-using industries in the State.

One of the information releases, based on this information, is the wood commodity drain by county and major species group for 1973. In addition, a report on the bark residues available for potential use and a buyers guide have been published.

Forestry Extension specialists are continuing to work on the collection and storage of essential forestry data. Immediate plans are to compile county information sheets on the forest resource in South Carolina. With the continued collection of survey data, additional publications and resource projections will be possible. This increased availability of forestry data should aid resource use and management at all levels.

In the past, landowners have experienced difficulty in obtaining a contractor to perform reforestation practices. With this in mind, Extension Forestry spearheaded a program to conduct three contractor workshops across the State. Approximately 130 people participated.

Other programs relating to reforestation were two television releases filmed at different locations in South Carolina. Each release was utilized by television stations in several areas of the State. A forest landowner newsletter was also used to contact landowners and inform them of reforestation opportunities.

During the spring of 1975, Extension Forestry specialists participated in five plant problem clinics, talking with over 1,600 landowners concerning their tree problems. Short courses were conducted on a variety of subjects such as hardwood log and lumber grading, forest management and forest taxation.

## *Horticulture*

Serving homeowners of South Carolina is a major function of Extension Horticulture. Home vegetable gardening, turf management and ornamental interests during the past year have been greater than at any previous time.

Greatest assistance to homeowners is provided through mass media. Concentrated efforts by county and University specialists in radio and television contributed much to the success in this area. Success can be measured by the many requests for information. More than 120,000 copies of home vegetable gardening literature have been distributed. Phone requests to county offices regarding assistance on turf and ornamentals have also significantly increased.

Through an interdisciplinary effort involving Plant Pathology, Entomology and Forestry, many successful clinics have been conducted. Early in the season instruction clinics were offered throughout the State and later plant problem clinics were held. An estimated 40,000 people were served in this manner. Major commercial training for ornamental producers is given through organized short courses. State-wide short courses have been offered for flower growers, greenhouse operators, turf managers and nurserymen. More than 500 major producers attended these schools. This makes up about 75 per cent of the total industry.

The Extension Horticulture vegetable staff continues investigation of new crops.

During 1974-75, production demonstrations of onions, potatoes and processing tomatoes were conducted. Weather variation resulted in poor quality of all commodities. Under a memorandum of understanding with McCall Farms, Agricultural Engineering and the Sandhill Experiment Station cooperated to plant a completely mechanized tomato production and processing test. Growth regulators were used prior to mechanical harvest with the Clemson tomato harvester. Harvest yields were not high due to fruit rot and cracking.

Clemson University's Extension Service has been awarded a \$75,000 Federal Extension Grant for development of a system for managing peach tree short-life in South Carolina. The grant is renewable for a period of three years within available pest management funds. Short-life is the major limiting factor in Southeastern peach production.

Edgefield County is the pilot area for the project. But it is anticipated that successful peach tree short-life management in Edge-



field will have regional and national application. Highlights of educational activities with peach growers were update meetings held in Spartanburg, Edgefield and Orangeburg. In addition, each grower received peach newsletters based on timeliness of the subject matter involved.

As a result of the pecan Extension program, which includes individual consultation with growers, supplemental follow-ups and grower demonstrations, many previously nonproductive orchards are now producing economical crops. Also, several high density plantings of the newer precocious and more prolific pecan varieties have been established.

### *Plant Pathology*

Members of the Plant Pathology unit have pooled efforts and activities with Horticulturists and Entomologists to provide information and assistance for home vegetable and fruit production. High food costs have caused both rural and urban people to move more in this direction.

Members of the unit assisted in preparation of a home garden manual of which 48,000 copies were distributed. Approximately 2,100 interested gardeners participated in multidiscipline production meetings, and about 24,000 people attended Plant Problem Diagnostic Clinics held in public areas such as shopping centers.

Approximately 1,600 vegetable and fruit specimens which related to home food production were received into the Plant Problem Diagnostic Laboratory on campus.

Programs to help growers and others to recognize crop losses due to parasitic nematodes have stimulated increased use of nematode control practices across the State. Notable areas of improvement are soybeans, peaches, cotton, vegetables and turf.

Several new plant disease control pesticides and cultural practices were screened for economic usefulness on growers' farms in test demonstrations during the year. Cost cutting factors and other economic aspects were carefully considered to better advise growers during the period of increasing production costs.

The primary role of providing timely and accurate information to growers—through county agents—was accomplished with publications, news releases, radio and television and personal contact.

### *Poultry Science*

A decline in the number of hatcheries in South Carolina for more than a decade has prompted remaining operations to expand to meet the demand for chicks and poults.



As problems pertaining to poor hatchability arise, it is difficult to pin-point causes. A joint effort by poultry science specialists and workers at the Clemson Livestock-Poultry Health Department was undertaken to locate and correct causes of poor fertility and hatchability in several facilities in the State.

As poultry waste increases in value because of fertilizer properties, another use for poultry waste under development is ensiling for cattle feed. Research on this is under way at Clemson. Tours through feeding facilities in other states and short courses have prompted requests for information and assistance in silo selection, ensiling, plans for cattle feeding facilities and ration formulation.

In cooperation with Agricultural Engineering and Animal Science, Poultry Science specialists with research personnel have developed a poultry litter feeding program for field trials this year.

A lack of nutrient requirement information for rabbits has prompted requests for assistance from producers and feed manufacturers. Feeding trials are under way, and basic rations have been formulated and recommended. A rabbit management bulletin has also been compiled, and Extension Poultry continues to serve in an advisory role with the Palmetto Rabbit Cooperative through publications, meetings, short courses and producer visits.

Many severe problems have occurred in poultry due to the contamination of feed by aflatoxins. In cooperation with the South Carolina Department of Agriculture, questionable feed and feed grain has been tested, enabling many producers to avoid what could have been severe problems.

Waste management guidelines have been developed in cooperation with the S. C. Department of Health and Environmental Control. Egg marketing promotion was approached in a joint effort with the newly-formed South Carolina Egg Board.

Plans for short courses, management schools and producer contact were also developed with other groups including Farm Bureau Poultry Committee, Southeastern Gamebird Association and integrated industry organizations.

### *Production-Marketing Economics*

The stress of rapidly changing conditions continues to demand stepped up programs of presenting cost and marketing figures for the State's farm producers, agri-business and consumer interests.

Extension Economics specialists conducted training meetings for county staff members, producers and various credit institutions to

explain outlook information and assess the impact of changing economic conditions.

Training meetings were also held to explain the international trade situation, its impact on the United States and South Carolina agricultural industry, and outline future trade potential as related to world production and demand.

In a totally new activity, the Department participated with the University of South Carolina in a first "Annual Outlook Conference," providing agricultural outlook information for business interests represented at the sessions.

Farm management schools were conducted for farmers in several counties to acquaint producers with basic management tools needed to properly assess alternative farm decisions. Areas covered included land rental versus purchase, machinery analysis, enterprise budgeting and cash-flow. Efforts were also expanded by training selected personnel in basic techniques, data acquisition and potentials for whole-farm planning.

In this time of rapidly changing input and product prices, it is critical that farmers are provided with modern technology to expedite better management decisions. Agents were introduced to computer techniques available to assist in more complete management decisions, data required to facilitate various analyses and analysis interpretation.

Two in-service training programs were presented in addition to the general agricultural training. A two-day training session in farm management was conducted for 25 selected Extension agents, and a one-day training session on estate planning and farm business organization was held in each Extension District.

The Marketing Information Center, a division of Extension Production-Marketing Economics, continued its role of providing marketing information to the fruit and vegetable industry.

The educational effort in tobacco marketing was oriented toward assisting farmers in making better decisions for an expected larger crop in areas of quota-leasing storage and preparation of tobacco for marketing.

An educational program was carried out to improve the proficiency of grain, livestock and cotton producers in using forward pricing as a tool for improved decision-making.

In coordinated efforts with other specialists, the Department worked to establish a computerized family money management



program to help families reassess spending needs and adjust spending plans to current circumstances.

Critical developments in beef cattle production brought special efforts to provide producers with economic and management information needed for adjusting to the situation. An interdisciplinary approach with other Extension personnel was utilized to meet with beef cattle associations over the State and present outlook information and suggest practices and steps to be utilized in coping with critical problems. Producer attendance was estimated at 1,000.

A program on production and financial management strategies for beef and swine producers was also presented in each of the three Extension Districts. Participating with specialists from Clemson were representatives from lending institutions.

### **Home Economics**

*Scope of Activity:* Just as in agriculture and industry, the modern family must cope with almost daily change and variations in living patterns that create new problems and provoke more stress.

And today's Extension Home Economics programs are broader and more comprehensive to serve the family needs in the complex society.

Traditional home economics programs must be strengthened and additional activities generated to answer the increasing demands. Youth development is one area of this expanded emphasis. Too few youths, it seems, are now being prepared in the home for meeting problems and responsibilities associated with a family and the family's relationship to the community.

Extension Home Economics is working to develop and disseminate the broad range of specialized information needed on this one facet of today's living.

As in all Home Economics programs, the county Extension staffs, backed up by subject matter specialists from Clemson, continue to meet with individual clubs, stage clinics, conduct classes and utilize mass media to provide information needed in coping with today's complex problems of homemaking and family living.

Highlights of some of those programs include:

#### *Child Development and Family Relations*

The Child Development and Family Relations program is influencing many South Carolina families through community programs and is reaching many audiences formerly difficult to serve.



Newlyweds and newcomers are being initially reached with a packet of informational material for each according to generally recognized needs. This contact generally leads to further participation in the program.

### *Expanded Food and Nutrition Education Program*

More adequate diets, enjoyable meals and a positive attitude toward life are recognized improvements of South Carolina families in Extension's Expanded Food and Nutrition Education Program.

Begun in 1969, it was operated in 26 counties during 1974-75 and has continued to make a measurable impact on the nutritional status and food practices of low-income families.

Families are reached through home visits and small group meetings by Extension Nutrition Program assistants living in the communities. They work with the families in improving food practices and nutritional knowledge. The Program assistants are supervised by county Extension Home Economists who provide basic in-service training and regular weekly training and counseling.

The youth have bi-weekly or monthly meetings in which lessons on basic nutrition, meal planning, food preparation and buying are taught. Some groups have garden plots and preserve some of the food for future use.

Since its inception, some 28,760 homemakers representing 136,830 family members have benefitted from the program. As of June 20, 1975, some 6,760 homemakers were enrolled. And during the past year the youth phase section reached 9,037, of whom 4,679 were new. A total of 808 volunteer leaders also were involved in working with the youth program.

### *Consumer Program*

Wardrobe planning and coordination, recycling clothing and clothing construction are three programs initiated by Extension to help families cope with rising clothing costs and inflationary budget pressures.

A series of five leaflets was prepared on wardrobe planning and recycling, and a kit on recycling clothing was compiled and made available to the counties for their use. Some county Extension Home Economists have also been training volunteer leaders to show others how creativity can extend limited wardrobes.

Members of the specialist staff are coordinating efforts in producing a weekly 13-minute educational radio program called "Consumer Corner." One program a month is devoted to clothing.

Since home clothing construction is still one of the most economical ways to extend a family budget, a series of basic construction leaflets has been developed to help the increasing number of individuals who want to learn to sew. District meetings were also held on this.

For several years, efforts have been made to improve the quality of clothing made by 4-H'ers, and a State 4-H Fashion Clinic offered a good opportunity to stress quality in clothing construction. County Extension staffs have also tried new approaches to getting information to homemakers on clothing. Consumer information exhibits have been set in plants, working homemakers taught during lunch breaks, and Extension exhibits established in shopping centers.

### *Family Resource Management*

Extension Home Economics went to the computers in 1974-75 in a continuing effort to help families deal with problems of money management. In cooperation with the Economics Department and Computer Center at Clemson University, a special program was developed to assist families in analyzing budgets, income and obligations in order to work out better management of resources.

This service is available to anyone through the County Extension offices, and a variation involves portable computer terminals which are taken to certain points to allow flexibility in usage. Trained agents are on hand to meet the public and talk with individuals about their financial concerns.

Budgets can be processed in a matter of seconds through the aid of Clemson computers.

Family resource management has also been stressed through a series of lessons and games for EFNEP and 4-H youths and a board game designed to teach money management to adults.

### *Housing*

Staff members in housing and home furnishings have been working cooperatively with two governmental agencies to help improve housing for low income families. In cooperation with the South Carolina State Housing Authority, they have trained program assistants and prepared training materials for the Basic Homes program.

They are also serving as resource people to a county Extension Home Economist who is counselor for the Turnkey III project in Spartanburg, a cooperative effort with HUD.



Home ownership and maintenance continues to be an important concern, and Extension Home Economists have developed and conducted programs in simple home repairs for club meetings, special interest programs, television, Consumer Expo and the Senior Citizens' Week at Clemson.

The Interior Design Short Course taught in the counties by Home Economists has also been revised, and staff members over the State received training in moisture control in the home, remodeling and major household appliances.

Parents with young children and child care workers are being involved in parent education through various means—Head Start Parent Groups, Newsletters and group meetings for child care workers and parents.

Youth with special needs are involved in classes for potential drop-outs, youth leadership workshops, preparation-for-marriage lessons, family relations group sessions and essay contests.

### *Food and Nutrition*

Food preservation has been of interest to almost every family during the year. Publications were revised and information on "drying" added. Extension began in early spring with food preservation workshops for County Extension Home Economists. Each county followed with an extensive educational program on canning, freezing, preserving, pickling and drying.

Lesson plans, scripts and visuals were provided by the nutrition specialists.

Workshops and demonstrations were held at county office buildings, shopping centers, stores and community buildings. Mass Media—radio, television, newsletters and newspapers—provided the public with information on available publications.

The SOS (Save Our Shapes) weight control program continues to be very popular. This program is designed and conducted on the thesis that nutrition knowledge needs to be and can be taught along with weight control.

Several counties provide nutrition education programs for senior citizens through the existing county program for the elderly.

"The Preschooler versus Food" is a home study course designed for mothers with children two to six years old. This four-lesson series was developed as a method to reach young homemakers who do not usually attend special interest group meetings.



## 4-H and Youth Development

*Scope of Activity:* Extension continues to broaden its 4-H programs to serve more South Carolina boys and girls through the youth activities. Participation during 1974-75 approached the 100,000 mark.

Of the total of 93,003 on 4-H rolls in the State, school enrollment, community and special interest groups reached 68,161.

The Expanded Food and Nutrition Education Program enrolled 9,037; another 1,726 received educational training through the 1890 program; and a special series of TV lessons reached 14,079.

Project activities through county Extension offices—where the youngsters may elect to participate in everything from automotive driving to fashion revue—continue to be the bedrock of 4-H, but renewed emphasis is being placed on group learning.

The summer camping program has been greatly expanded, a teen leaders' retreat for 4-H'ers broadened and continued focus placed upon such activities as the State Conference and Electric Congress.

The volunteer leaders' program has been organized in an effort to gain greater utilization of skilled individuals in the communities who lend special talents for 4-H activities under supervision of Extension professionals.

### *4-H Camping Program*

A Statewide effort was made to increase 4-H camp attendance, develop new camp programs and improve facilities.

As a result, camp attendance for the year increased 61 per cent, with a total of 4,784 4-H'ers taking part during 1975. The goal for 1976 is an additional 20 per cent increase.

Educational subject matter areas were increased from six to nine. Recreational facilities at both camps were improved and expanded to include new games and sports activities. Improvements or additions consisted of basketball courts, boats, a miniature golf course at one camp, more bicycles, new ping pong tables, archery and basic athletic equipment.

Major improvements were completed on physical facilities at Camp Bob Cooper and Camp Long.

Improvements at Camp Long included four new bathhouses, dishwasher, all buildings painted, new public address system, horse show ring and bridge rebuilt across the lake.

At Camp Bob Cooper, all bathrooms were remodeled, new ceiling, paneling and lights were added inside the assembly building, swimming area improved, kitchen painted, dishwasher added, and a horse show ring built.

Major improvements are planned for both camps in 1976. A new kitchen is scheduled for Camp Long. Painting of all buildings and plumbing repair is expected at Camp Bob Cooper.

### *Gifts Presented*

More than \$6,000 in gifts, ranging from sewing machines to kayaks, were donated to South Carolina's 4-H camps by FCX, Inc. An official presentation was held at Camp Long June 25 where some 300 4-H'ers and several Clemson University officials acknowledged the gifts from the farm supply cooperative.

Gifts included 24 sewing machines, two tool kits containing a sander, router and skill saw, two microwave ovens, two crafttool instruction books and six kayaks. They were used for training youths at the two camps.

The gifts were the result of a cooperative program with Dow Chemical, USA, and were made available to distributors of Dow agricultural products.

### *Citizenship Shortcourse*

Sixty-two 4-H'ers from 15 South Carolina counties participated July 13-19 in The Citizenship Shortcourse in Washington, D. C., for a closeup view of government operations and democracy in action. Headquarters was the National 4-H Center, where the South Carolina delegation participated with 4-H'ers from 12 other states.

They utilized Washington resources to study individual responsibility in citizenship, free enterprise, energy resources and use, international interdependence, community development and the Bicentennial. Special tours included Mount Vernon, Lincoln Memorial, Library of Congress, Smithsonian Institute, John F. Kennedy Center and the National Zoo. One of the highlights was a day at Capitol Hill for visits with members of the South Carolina congressional delegation, observing House and Senate activity, and the Supreme Court.

### *State 4-H Teen Leader Retreat*

More than 250 4-H teens from 43 counties participated in the teen leader training at Camp Long, June 4-6. The general learning objectives were to provide opportunities for 4-H teens to learn



new skills in leisure education areas of arts, crafts and recreation that would be of personal benefit and to provide personal skills which the teens could teach others in their home communities. Additional special programs included government awareness, personal protection and personal development. The 1975 participation of 250 represented a 75 per cent increase over the 1974 attendance of 188.

#### *4-H Adult Leader Forum*

A one-day training session for adult 4-H volunteer leaders was held at the Clemson House July 30. Sixty-four leaders from 23 counties attended.

Topics presented were: Project and Activities in 4-H, Resources for 4-H, Community Projects and the Bicentennial, Self-Concept Development and Involving Youth and Adults. Discussions on working together with the county Extension staff were also held. The group voted to reorganize a state leaders' organization, and officers and directors for the association were elected.

### **Community and Resource Development**

*Scope of Activity:* This work is designed to provide educational and technical assistance to groups interested in taking collective action to improve the level and quality of life in their communities.

Emphasis is placed upon providing assistance which will enable citizens to solve their own community problems rather than attempting to impose ready-made solutions developed outside the community.

The community, in this sense, may vary from a small neighborhood to the entire State.

Much of the CRD effort is devoted to identification and definition of problems, identification and evaluation of alternative solutions, and development of leadership qualities in local citizens that will enable them to perform these functions in the absence of outside help.

#### *Williamsburg Human Resources Campus*

A request was received in late 1974 from the Williamsburg County Health Center Commission for technical assistance in developing a preliminary conceptual plan for the development of a county Human Resources Center.

The facility will provide a one-stop location for medical and social services to include the county health department, vocational



rehabilitation service, mental health clinic, alcohol and drug abuse clinic, and the county hospital and physician's office building which are already located on the site.

Currently, several of these facilities are scattered throughout the town and are inadequately housed. The campus concept would minimize client transportation problems, reduce duplication of facilities and services, encourage interaction and coordination among agencies and provide adequate housing for the agencies.

The Extension CRD section of the Department of Agricultural Economics and Rural Sociology coordinated the project with the assistance of a consulting architect and various state and local agencies including the County Planning Commission, State Department of Social Services, State Department of Health and Environmental Control and the Waccamaw Regional Planning and Development Council.

The project was approached in two phases. One was to develop information on the requirements of the proposed facility including the agencies to be housed, the concept of their operation, their relationship to each other, their space, circulation, and service requirements, and their relationship to the existing hospital and physician's facilities.

In the second phase, this information was to be used to develop alternative scaled models of the facility and alternative ownership-management-financing systems for use in arriving at final design decisions, generating public support and obtaining funding assistance.

#### *Land Use Education Program*

One of the most important issues to be faced by South Carolina citizens over the next generation is wise management of land resources. Educational effort toward creating a general public awareness of this issue is a high priority in Extension CRD, and activities relating to this have been conducted over the past year through a broad range of methods.

Meetings were conducted or programs presented on land use at the request of local private and public organizations in Anderson, Charleston, Cherokee, Darlington, Edgefield, Florence, Horry, Newberry and Pickens counties. In addition, various presentations and assistance were provided State organizations and agencies.

Two slide-tape programs on land use were developed and used in county fairs and expositions.

Articles in four volumes of our monthly departmental publication were devoted to land use topics, and three issues of the CRD newsletter presented information on land use.

One new publication on land use was released and numerous copies of existing publications were distributed to the public.

It is anticipated that land use education activities will increase substantially over the next few years.

#### *Fire Protection, Leadership, and Beautification*

Fire protection in rural areas is a growing concern. During the past year, Extension CRD staff members released one new publication to serve as a guide to those interested in establishing rural fire protection and were instrumental in developing plans and support for a county-wide system in Bamberg County. This was a joint effort among Bamberg citizens, officials, agencies and the County Extension Office.

Another important and growing activity is identifying local leaders as potential community development committeemen and organizing them into a potent force for community improvement. A complementary program which has received emphasis during the year is designed to educate high school age youth leaders in the need for, and the process of, achieving community development. Programs have been conducted in several counties under the leadership of the County Extension Office.

The Extension CRD program also provides primary impetus in local areas for the Governor's Beautification and Community Improvement Program. This was revitalized during the year with revisions in the awards system to allow wider recognition and encourage better participation. County and State Extension personnel are providing new emphasis, and preliminary indications are that participation will increase substantially.

#### **Special Programs**

*Scope of Activity:* Despite the trend toward large mechanized farms and a decreasing number of farm operators, the small family farms with limited incomes still exist in South Carolina.

Many of them have basic problems in lack of knowledge of farm management, planning, proper pest control, soil preparation and fertilization, livestock management, harvesting and marketing farm products.



### *Participation Increases*

The Special Programs area increased participation of small family farms in agricultural projects in fiscal 1974-75 by developing and carrying out more "low income" activities. Area agents (professional) and Agriculture Science Assistants (para-professional) working with County Extension Staffs went into the communities to provide technological assistance to improve efficiency, aimed at helping increase incomes through the recommended practices.

Special programs committees, organized primarily among clientele from low-income families, were effective in helping Extension personnel identify areas in which help was needed.

In some rural areas with concentrations of small farms, programs were developed to help resolve their problems through such available resources as labor, equipment and investment potential.

### *Demonstrations Set Up*

Technological assistance was provided to improve farm efficiency through on-farm demonstrations in crops and livestock. These included all-practice demonstrations of any row crop produced on a farm, utilizing the latest practices in herbicides, fertility, insect control and harvesting. Another area was swine feeding demonstrations for feeder pig operations.

Efforts were also made in both adult and youth programs to increase family incomes through more home gardening and marketing.

Significant progress was reported for the year in improving the quality of swine for small producers. County Extension Staffs, area livestock agents, 1890 personnel and animal science specialists coordinated efforts to improve the quality of feeder pigs and top hogs by placing and replacing brood sows on cooperating farms with selected bred gilts from top commercial farms in the area. Quality boars were also provided, and low-quality breeding stock was sold to help finance the projects.

In other activities, tours, workshops and mass-media approaches through radio, television and newspapers were utilized to provide educational information for generally improved standards of living for the clientele of Extension's Special Programs.



## 1890 Extension Program

*Scope of Activity:* The 1890 program is continuing its effort to implement innovative ideas to upgrade the quality of life for low-income rural farm and non-farm families.

Work is conducted by South Carolina State College in cooperation with the Clemson University Extension Service, providing another approach for grassroots education and outreach for segments of the population that are out of touch with traditional uplift programs.

The program is federally funded for 1890 Land Grant Institutions, a qualification met in South Carolina by South Carolina State College. It is directed by a coordinator at State in Orangeburg, with the Clemson Extension Service cooperating through joint use of resources and programs.

Counties served are Chesterfield, Georgetown, Hampton and Marlboro.

### *Professionals Are Employed*

During the year, additional professionals were employed to help establish and achieve desired goals in the program.

An associate district coordinator and instructor of rural education was named to help in training of 1890 personnel in the counties, work with county coordinators in the promotion of family living and youth programs, co-direct camping, assist in writing annual plan of work, and attend meetings, conferences and workshops relating to Extension education.

County coordinators were also employed for Hampton and Marlboro.

In the area of family living in the 1890 program, an increased production of food for home use was reported, with more families planting gardens and carrying through with better canning and freezing practices.

More families in the program also are making better use of local community services, such as food stamps, with improved buying practices, and health services.

### *Family Housing Improves*

Improvements also are noted in family housing situations, with many able to make home repairs or relocate into better facilities. Sewing techniques and homemade furnishings ideas are also being reflected in interior improvements.

Training for program assistants in the area of family living is being provided on a monthly basis, helping them to reach families more effectively.

### *Special Camps Conducted*

The special camping program was conducted June 6-July 31, and the employment of two staff instructors in arts and crafts and industrial arts helped improve the quality of the program.

The industrial arts classes also provided opportunities for campers to develop skills in simple household repairs and maintenance in such areas as screen doors and windows, construction of steps, windowpane replacement and others.

One highlight of the camping program was a visit by Edwin L. Kirby, administrator of the Extension Service in Washington.

### **Information Services**

*Scope of Activity:* To fulfill its primary mission of disseminating "useful and practical information" to all citizens of the State, a Public Service Information division of Clemson's Public Relations Department conducts a continuing news program through media outlets.

Daily articles and feature stories detailing new developments in recommended agricultural practices as well as homemaking news for the consumer front are prepared and mailed to newspapers and special interest publications. These are developed in collaboration with subject matter specialists, researchers and administrators of Clemson University.

First-hand coverage is also given on activities over the State, including producer problems and successes, field days, tours, workshops and other programs of special interest to the public.

For its sustained excellence in communications during the year, the Public Service Information division received a national first-place award by the American Association of Agricultural College Editors.

## Appropriations for Extension Service

1974-75

State Appropriations .....	\$ 4,986,627
Federal Smith-Lever .....	3,356,726
Federal Farm Safety Project .....	15,000
Federal Resource Conservation .....	14,053
Federal Community Development .....	53,709
Federal Nutrition Fund .....	1,531,738
Federal AMA .....	5,108
Federal Smith-Lever 1890 College .....	466,472
Federal-Rural Development—Title V .....	20,905
Federal Smith-Lever Special Cotton Project .....	21,245
Federal Peach Tree Short Life Project .....	75,000
Federal Smith-Lever Rural Development .....	53,509
	<hr/>
	\$10,600,092

## Expenditures by Projects

1974-1975

Administration & Supervision .....	\$ 940,848
Ag. Communications .....	490,266
Plant Sciences .....	693,676
Animal Sciences .....	463,002
Ag. Economics .....	98,836
Ag. Engineering .....	162,987
Conservation .....	15,011
Marketing .....	134,878
Home Economics .....	263,825
Four-H Club .....	350,026
Community & Resources Development .....	144,148
Federal Nutrition Program .....	1,203,329
1890 College Program .....	428,321
County Operations .....	4,456,808
	<hr/>
	\$ 9,845,961
Unexpended Balance June 30, 1975 .....	754,131
	<hr/>
	\$10,600,092



## DIVISION OF REGULATORY AND PUBLIC SERVICE PROGRAMS

L. H. Senn, Director

This Division of Clemson University operates several consumer protection type programs that are closely related to the agricultural sector. The philosophy for having some regulatory type programs at Clemson is that certain regulations can be enforced more effectively when strong educational approaches are used. Regulatory and Public Service Division uses this technique as a normal procedure. It also maintains close coordination with the Cooperative Extension Service and the S. C. Agricultural Experiment Station, and solicits their aid when additional educational and research efforts are needed. Strict enforcement is used only against recalcitrant offenders.

The major objective of this Division is to ensure that consumers buying fertilizers, pesticides and seed get the qualities that are indicated on tags or labels; and additionally, to carry out the regulations of the Crop Pest, Bee Diseases and Abandoned Orchards Acts and to impose quarantines when needed.

In legislation passed by the General Assembly and signed by the Governor on June 4, the Division was also given the responsibility for enforcing the new South Carolina Pesticide Control Act.

The following report highlights activities of the Division during 1974-75.

### Plant Pest Regulatory Service

*South Carolina Economic Poisons Law:* A total of 387 companies registered 3,961 products. The total number of pesticide samples collected and analyzed was 1,843. Only 101 (5.5 per cent) were deficient in one or more components. Again, the majority of the deficiencies involved methyl parathion-toxaphene formulations. The Department collected \$64,505 in fees.

The new South Carolina Pesticide Control Act became law in 1975. This Act repeals the Economic Poisons Law and the South Carolina Disinfectants Law previously administered by the Department of Agriculture. In addition to requiring the registration of all pesticides sold, distributed or transported intrastate, it also governs the use and application of pesticides and provides for the certification of applicators using restricted-use pesticides.

*Nursery, Bee and Sweetpotato Inspection:* Five hundred and thirty-one nurseries, greenhouses and vegetable transplant growers

were inspected and certified to sell and ship plant materials. This comprised 1,713 acres of plant stock.

Thirty-eight sweetpotato inspections, including storage, plant bed and field inspections, were performed for 19 growers in eight counties. Inspections involved breeder, foundation, certified and regular seed stock. The majority involved regular seed stock with scurf being the most frequently encountered disease.

Less than two per cent of 2,569 bee colonies inspected were found infected with foulbrood disease. The disease was severe enough in several hives to warrant their destruction. Other hives were placed on a treatment program using terramycin to alleviate the disease.

*Phytosanitary Export Certificates:* Sixty-two phytosanitary export certificates were issued for plants and plant products moving interstate and being exported to foreign countries. Materials involved were assorted nursery stock, cotton, soybean and dried pepper seed, peanuts and coastal bermuda cuttings.

*Forest Pests:* Dutch elm disease was confirmed in five new counties, bringing to 13 the number of counties in the State where the disease has been found.

*Phony Peach:* During the 1974 survey season, approximately 2.3 million peach trees were inspected for phony peach disease. Destroyed were 1,024 trees, compared with 367 last year.

A wild plum herbiciding program was initiated during the winter, involving the application of dormant sprays only. The purpose is to eradicate the wild plum thickets adjacent to commercial peach orchards, thereby eliminating a primary host and source of inoculum associated with phony peach disease.

#### *Cooperative State-Federal Programs*

*Imported Fire Ant:* A total of 483,256 acres was treated in separate control programs conducted during the fall and spring. Counties and the number of acres treated were Richland (241,000), Hampton (232,500) and Kershaw (9,706). The treatment in Hampton County was monitored by Environmental Protection Agency personnel. Mirex bait was supplied to all County Extension Service offices for repackaging and distribution on a request basis.

*Insect Survey and Detection:* Two male gypsy moths were trapped in Horry County in campgrounds close to Myrtle Beach.



The Cooperative Economic Insect Survey program recorded 31 new county records for various beneficial and injurious insects.

*Witchweed:* Infestations on 418 acres were found on 11 new farms. A total of 5,440 acres received one or more herbicide applications for witchweed control for an aggregate of 12,911 acres treated.

**Department of Fertilizer Inspection and Analysis**

The Department of Fertilizer Inspection and Analysis is responsible for enforcing the provisions of the South Carolina Fertilizer Law, (R672, H1792) 1954, (R1189, H2415) 1970. Some of the major activities of the Department for the July 1, 1974-June 30, 1975, period are listed:

Fertilizer usage data—tons .....	798,780
Number of fertilizer samples procured and analyzed ..	5,094 *
Total number of samples not meeting guarantee ....	990
Per cent of samples deficient .....	20.1
Number of irregularities other than underweight ....	1
Number of irregularities for underweight at dealers' warehouses .....	14

\* The difference between samples procured (5,094) and samples reported (4,935) is attributable to lime samples and unofficial fertilizer samples being included in the total.

Penalties collected, payable to State Treasurer (Deficiencies where consumers not identifiable) ..	\$ 23,964.84
Fines collected, payable to State Treasurer .....	1,270.00
Registration fees collected, payable to State Treasurer ..	4,559.00
Fertilizer taxes turned over to State Treasurer ....	198,372.18
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Total monies sent to State treasurer .....	\$228,166.02

*Change in Fertilizer Supply Situation*

The fiscal year 1974-75 indicated extremes in fertilizer supply. At the beginning of the year inventories were extremely low and in some places nonexistent. This was especially true for nitrogen materials. As the season progressed, there were indications that production would match or exceed demand, and inventories began to build.

Fertilizer manufacturing plants operated at maximum production levels; however, with high fertilizer prices, dry fall weather,



low cattle and cotton prices and other factors, there was a reduction in farmer demand, which contributed to inventory buildup. This started in the early fall and continued throughout the entire fiscal year. At the end of June there was an adequate supply of most fertilizer materials and mixed fertilizer in South Carolina. Many dealers only bought on consignment and did not carry heavy inventories into the summer.

For the entire year the mixed fertilizer tonnage was 20.2 per cent less, and the nitrogenous materials tonnage was 8.8 per cent less than that for the previous year (1973-74). Total mixed fertilizer and materials tonnage was 17.2 per cent less than last year. Nitrogenous materials tonnage sold in 1974-75 was only 1.2 per cent less than that of 1972-73.

### *Fertilizer Quality Control*

The overall quality of fertilizer during the year indicates less than a desirable situation. Several factors contributed to this situation including reduced analyses of certain raw materials and poor physical condition. Excessive amounts of chlorine and deficiencies in micronutrients contributed to the overall problem. There was an increase in excessive chlorine for tobacco grades, which resulted mainly from a temporary shortage of low chlorine potash materials. As is the usual case, some companies are doing a much better job than others. The poorer performing companies have been made aware of the undesirable situation, and efforts are being made to improve.

Inspectors took more than 5,000 fertilizer and lime samples during the year, and an attempt was made to delineate problem areas so that corrections could be made. Companies also were furnished computer printouts with detailed analyses of the quality control factors as indicated by the analyses of samples drawn.

For the year the average deficiency percentage of samples containing N,  $P_2O_5$  and/or  $K_2O$  was 15.2, whereas the average deficiency percentage for samples containing secondary and/or micronutrients was 15.7. A preliminary tally indicates that 20.1 per cent of all official samples drawn in the State last year were deficient in one or more nutrients. This compares with 17.9 per cent in 1973-74, 14.3 per cent in 1972-73, and 18.1 per cent in 1971-72.

### *Liming Materials Bill*

Most states have laws regulating the sale and quality control of agricultural limestone. South Carolina has never had such a law. Currently there is only one company mining agricultural limestone

in the State, and until 1974 most of the agricultural limestone being shipped into the State came from states that had lime laws. Therefore, most materials offered to farmers were somewhat regulated by other states' laws. With the increase in demand for lime and a shortage of railcars, the lime situation became critical during 1974 and continued in 1975. Materials were offered to farmers that were not monitored by any agency. At the same time trucks were being used to transport lime from sources outside of South Carolina, and many times the dealers did not know the type of lime being transported nor the quality of the lime. A number of farmers and dealers felt there should be some regulation in South Carolina. Some of these people contacted members of the South Carolina Legislature.

Senator T. E. Garrison of Anderson requested that the Fertilizer Inspection and Analysis Department draft an agricultural liming materials bill. This was done, using the Uniform Bill suggested by the Association of American Plant Food Control Officials and the recently enacted Virginia Lime Bill as a guide. Senator Garrison introduced the bill on April 10. The provisions of the bill provided for regulations specifying minimum requirements for calcium carbonate equivalent and particle sizes. It also provides for the guarantee of calcium and magnesium for those companies desiring to guarantee these elements.

The bill, designated as S373, was passed by the Senate and introduced in the House of Representatives where it was referred to the Agriculture and Conservation Committee. The bill was not reported out before the Legislature adjourned and did not become law. Even though the bill did not pass, the groundwork has been laid for possible passage in 1976.

### **Department of Seed Certification**

Seed Certification is a program of standards imposed on seed and plant production that insures varietal purity and good germination. Participation of farmers in the program is voluntary. The Department of Seed Certification is designated by law as the official agency for certifying seed and plants in South Carolina.

Field work of the Department in 1974-75 involved inspection of 56,006 acres of crops. Applications from farmers for certification totaled 680. Some 72 varieties of 13 crops were field-inspected. Each field was inspected to determine that the crop was true to variety and free of noxious weeds. The major crops in the program with acreages inspected in 1974-75 were soybeans (23,076), cotton (20,491) and small grains (10,797).



The 5,451 acres of wheat inspected in May 1975 were the most ever inspected for certification in the State.

In addition to field inspection work, the Department issued certification tags to South Carolina farmers for 659,071 bushels of certified seed in 1973-74. Certified seed tags are issued only for seed which has passed field inspection and met quality standards after harvesting and processing. The number of certification tags issued in 1974-75 was 189,000 below the previous year. This is explained by the fact that tags were issued for only 2,475 tons of certified cottonseed in 1974-75, compared with 5,087 tons in 1973-74.

The Board of Directors of the Association of Official Seed Certifying Agencies lowered the germination standard for certified cottonseed in the United States from 80 per cent to 70 per cent in October 1974. This action set the stage for seed certifying agencies to permanently lower their cottonseed germination standards from 80 per cent to 70 per cent without having to label seed in this range as "Below Standard in Germination." The need to lower the standard was the result of increased mechanical injury to seed caused by more efficient picking and ginning equipment used in recent years.

However, an obstacle had to be cleared before this change could go into effect in South Carolina. The South Carolina Seed Law required sub-standard labeling on any cottonseed germinating below 75 per cent. The Seed Certification Department requested in January that the Boards of Directors of the South Carolina Crop Improvement, South Carolina Foundation Seed and South Carolina Seedsmen's Associations consider recommending to the South Carolina Commissioner of Agriculture that the cottonseed germination standard be lowered to 70 per cent. The Boards' recommendation was favorably received by the Commissioner, and the change was enacted in April 1975.

Another change in the South Carolina Seed Law, recommended by the Seed Certification Department, was approved and also went into effect in April 1975. This change allowed the shortening of the date of test requirement from nine months to six months for cottonseed, soybeans and peanuts. A six-months date of test requirement enables producers of these oil-seed crops to plan for the date of test to expire at about the same time planting of the crop is concluded. This prevents the producer of the seed from being held responsible for the germination of seed carried over by a purchaser beyond normal planting time.



Generally good stands were obtained with certified cottonseed and soybeans this spring, and only a few seed complaints were received. However, some quality problems are showing up in certified small grain harvested in June of this year. Occasional low germinations and noxious weed seeds are causing some lots of seed to be rejected for certification. Samples of low-germinating small grains are being examined by the Pathology Department to determine if a particular pathogen may be causing the problem.

Prolonged rains during early spring prevented many grain fields from being sprayed, and as a result, noxious weeds, and particularly wild onions, were numerous in many fields.

## **LIVESTOCK-POULTRY HEALTH DEPARTMENT**

**Carl Boyd, Director**

The Livestock-Poultry Health Division conducts a number of animal regulatory programs in the field of consumer protection and in the area of animal health and the diagnosis of various disease problems in South Carolina livestock.

The Division's three main areas of responsibility are the Diagnostic Laboratory, the Livestock Regulatory Programs, and administration of the State Meat and Poultry Inspection Program. Personnel of the Division are located throughout the State to provide the inspection services provided for by law.

The Animal and Plant Health Inspection Service, U. S. Department of Agriculture, cooperates with the Livestock-Poultry Health Division in carrying out certain animal disease eradication programs, which are being conducted on a national basis, and also provides 50 per cent of the funds for administering the S. C. Meat and Poultry Inspection Program.

Highlights of the Division's activities during 1974-75 follow.

### **Meat and Poultry Inspection**

This Division entered the field of consumer protection in 1967 when the General Assembly passed the S. C. Meat and Meat Food Regulations and Inspection Law and assigned Clemson University the responsibility for the administration of the law. Two years later the S. C. Poultry Products Inspection Act was passed. The Division's responsibility covers the wholesomeness of meat and poultry and the food products slaughtered and processed at all processing plants in the State except for seven plants that operate under Federal jurisdiction.

A total of 129 red meat plants in 43 counties and 48 poultry plants in 17 counties were under state inspection at the end of the fiscal year. The full-time staff consists of nine veterinarians, 77 inspectors, a compliance-evaluation officer and one secretary. More than 100 million pounds of red meat and poultry and almost 200 million pounds of processed meat and poultry products were inspected in state-inspected plants during the year.

### **Livestock Regulatory Programs**

These programs are conducted in cooperation with the Federal government, which supplies personnel and funds on a 50-50 basis to administer the national animal disease eradication programs.

*Brucellosis:* Although there has been a national increase of 12 per cent in the infection rate over the past year, South Carolina maintains a Certified Brucellosis-Free status which was established in March 1972. Annual losses to the livestock and dairy industries in the country have been reduced from about \$100 million in 1969 to about \$15 million in 1973. Without State and Federal efforts to control and eradicate brucellosis, the disease could cost the livestock and dairy industries as much as \$365 million a year, based on official estimates. The Division continues to monitor dairy herds in South Carolina by the brucellosis ring test four times a year and to test all replacement cattle at stockyards. This is necessary to prevent the introduction of the disease in animals imported from neighboring states.

*Hog Cholera:* No hog cholera has been reported in the United States in 1974-75. The last case of cholera in South Carolina was reported on November 2, 1972. After six months without an additional case, the State was declared Hog Cholera "Free" on May 4, 1973. A surveillance program is continued on South Carolina swine to make sure the disease does not get back into the State through infected or exposed imported swine. The Secretary of Agriculture's Advisory Committee on Hog Cholera Eradication has recommended the nation be declared officially free of the disease 18 months after the last positive case in the U. S. is followed by a three-year surveillance program.

## Animal Diagnostic Laboratory

The laboratory is presently staffed by seven veterinarians and 11 technicians. It provides diagnostic services in animal pathology, bacteriology, virology and serology for the State-Federal regulatory programs as well as diagnostic help to practicing veterinarians and livestock or poultry owners in the State. The laboratory is in a position to isolate and identify many diseases of animals which are impossible to differentiate clinically. During this year the Laboratory handled more than 3,000 cases and conducted more than 200,000 laboratory tests and examinations.



